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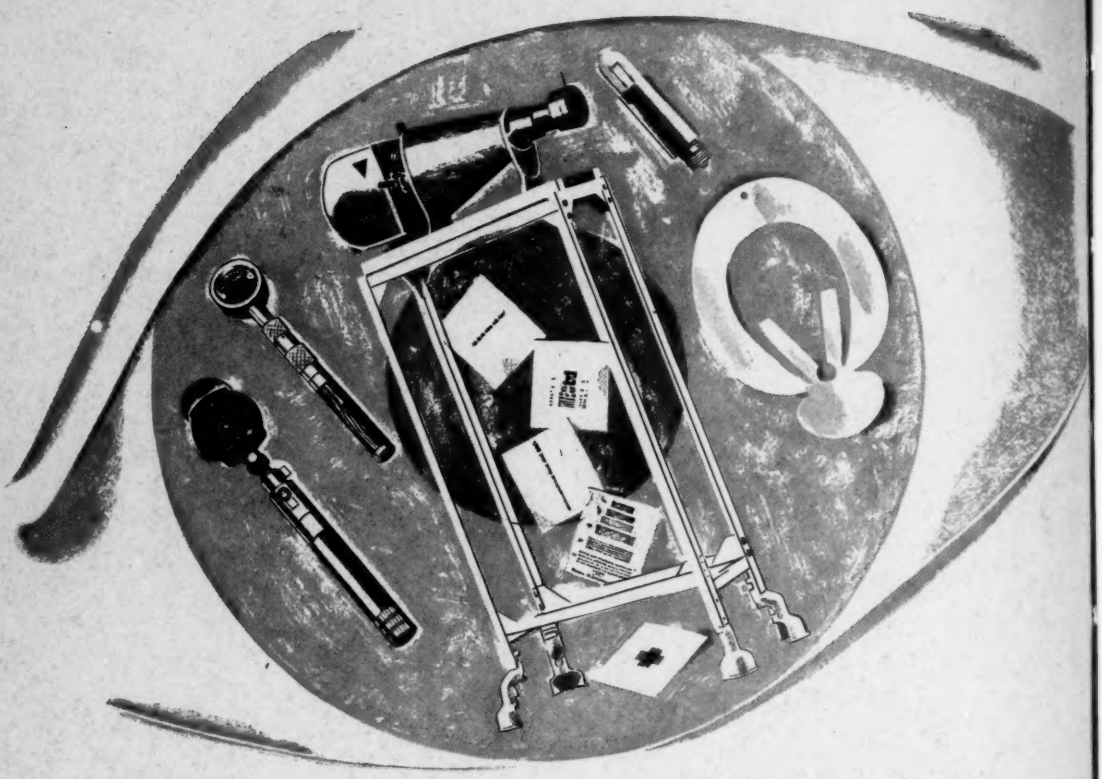

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FIG. 1

FIG. 1 (LUO). SHOWING THE TUMORS ON THE LID CONJUNCTIVAE OF THE LEFT EYE.

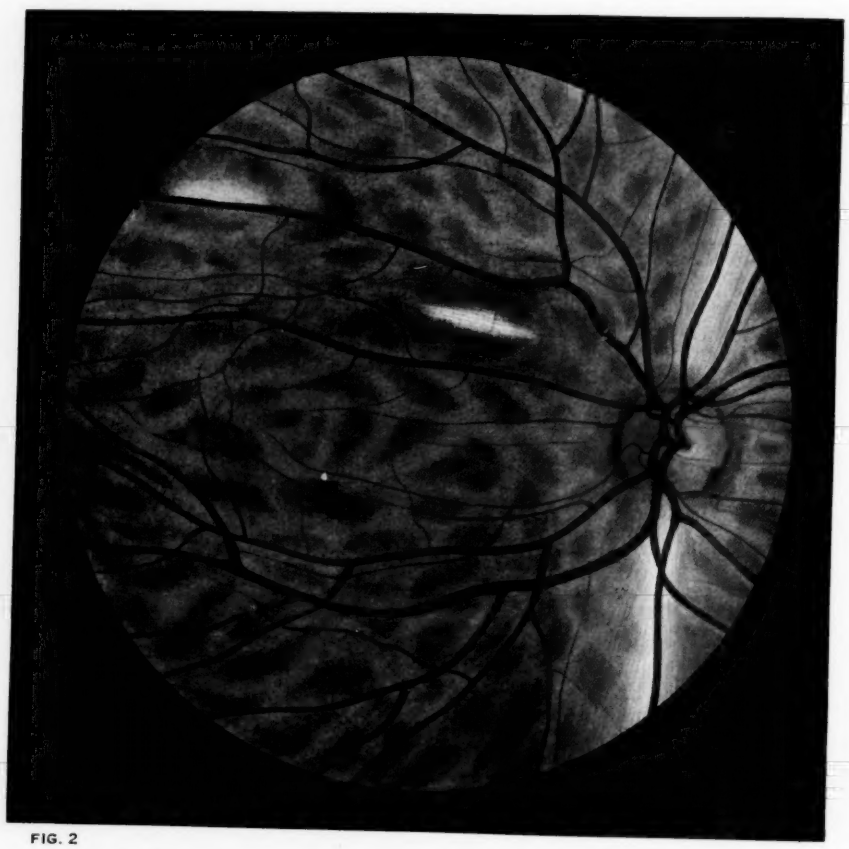

FIG. 2

FIG. 2 (LUO). SHOWING THE RETINAL LESION IN THE LEFT FUNDUS.

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RETINAL LESIONS IN LUPUS ERYTHEMATOSUS*

A. E. MAUMENEE, M.D.
Baltimore, Maryland

During the past few decades certain clinical and pathological findings have been grouped together to form a disease or symptom complex known as acute lupus erythematosus disseminata. Ophthalmoscopically visible lesions of the retina or choroid have been found in a number of patients with this disease, but histological examination of the ocular changes has been reported in only four instances and there are wide discrepancies in these reports. Three cases of acute fatal lupus erythematosus (cases 1-3), and one case of chronic disseminated lupus erythematosus terminating in disseminated tuberculosis (case 5) are in the records of the Johns Hopkins Hospital; and a fourth case of acute lupus erythematosus (case 4) is available from the Sinai Hospital.** Retinal lesions were found in every patient on both ante-mortem ophthalmoscopic examinations and post-mortem histological examinations. These five cases form the basis for this report.

The characteristic features of acute lupus erythematosus disseminata are as follows: (1) a prolonged low-grade fever with complaints referable to the synovial and serous membranes;[1] (2) endocarditis (nonbacterial vegetations on the heart valves);[2] (3) nephritis with "wire-loop" lesions of the glomerular vessels;[3] (4) erythematosus skin lesions;[4] (5) leukopenia; and (6) anemia. The etiology of the disease is essentially unknown; it has been ascribed to tuberculosis, to septicemia, or to a generalized toxic reaction similar to the Shwartzman phenomenon. Acute lupus is usually fatal in from two months to four years, terminating in pneumonia, disseminated tuberculosis, or overwhelming toxemia. Diagnosis is based on clinical findings and substantiated by pathological examination. No one lesion is necessarily present in any given case. As Mallory[5] has pointed out, it is not always possible for the pathologist to make a final diagnosis even in a patient with typical clinical manifestations.

A condition characterized by cutaneous lesions somewhat similar to those of acute lupus, but with no systemic manifestations, is known as *chronic discoid lupus erythematosus.* This disease is typified by small, scaly, atrophic patches of pigmented skin on the face. If the skin lesions become more or less confluent and widespread over the body, and there is an absence of systemic manifestations, the condition is called *Chronic disseminated lupus erythematosus.* Although the exact relationship of these dermatological processes is not known, cases of chronic lupus (either discoid or disseminated) sometimes develop into the acute disseminated form with fatal termination.[6]

* From the Wilmer Ophthalmological Institute of the Johns Hopkins Hospital and University.

** Reported by the courtesy of Dr. Samuel Wolman of the Sinai Hospital.

Review of ophthalmic literature

Bergmeister,[7] in 1929, was the first to mention retinal lesions in a patient with acute lupus. He examined the fundi of a patient three weeks after an exacerbation of the skin lesions. At this time the disc of the right eye was hyperemic, and there were irregular white patches alongside the retinal veins. Scattered throughout the fundus of the left eye were many "cotton-wool" exudates, with a number of small white dots in the macular region. The blood pressure was within normal limits. Two weeks after this examination the patient died with disseminated tuberculosis. The eyes were not examined histologically.

Abramowicz and Dulewicz[8] described a patient with acute lupus who was found to have blurring of the discs' margins, with a number of small, light-colored spots in the maculae. During the period of observation the number of retinal lesions altered according to the severity of the general condition, but there was no change in the character of the lesions. The ophthalmoscopic picture was said to have resembled that of "retinitis guttata" as described by Dimmer. No mention was made of the death of the patient.

Pillat[9] examined the fundi in 48 cases of chronic lupus erythematosus. In 16 of these patients he found lesions with an ophthalmoscopic appearance which he thought resembled that of healed tuberculous choroiditis. Three of the patients with ocular lesions subsequently developed acute lupus. Fresh pathologic alterations of a different character were noted in the fundi of two of these three patients soon after the activation of the skin lesions. These fresh changes were described as indistinct, slightly elevated, grayish-white or yellowish foci of choroiditis in the posterior part of the fundi. (Old areas of healed choroiditis were still present in the peripheral part of the same fundi.) No histological examinations were made of the eyes.

Baehr, Klemperer, and Schifrin[2] in a report of 23 cases of acute lupus with fatal termination mentioned fundus changes in 12 instances. These changes consisted of perivascular retinal hemorrhages, occasional fluffy exudates, and occasional circumpapillary edema. The blood pressure in all but 1 of the 12 patients was normal, so that the lesions were interpreted as being due to essential changes in the retinal vessels, rather than a phenomenon associated with hypertension.

Klauder and Ellis[10] recently reported a case diagnosed as acute lupus, without systemic manifestations, in which the patient developed retinal lesions described as "various-sized, irregular, fluffy, cloud-like patches scattered throughout the fundus of the right eye, particularly around the disc." Three small fresh hemorrhages were seen around the macula. The appearance of the fundus of the left eye was similar to that of the right but the involvement was not so extensive. The retinal and skin lesions improved on treatment with gold and sodium thiosulfate. At the end of a year and three months the "exudative retinitis" could no longer be seen, there was slight pallor of the discs, some of the larger vessels were "replaced by scar tissue," and other vessels exhibited varying degrees of sclerosis.

Goldstein and Wexler[11] reported a fatal case in which a probable, but not conclusive, diagnosis of acute lupus was made. Ophthalmoscopic examination shortly before the patient died revealed that both discs were pearly white with serrated edges, there was some perivasculitis of the retinal arteries, and there were numerous discrete, punched-out areas of retinal atrophy bordered by a

fringe of pigment scattered throughout the posterior fundi. On histological examination there was so much degeneration of the media of the retinal arteries that it was impossible to tell them from veins a short distance from the disc. Sections through the spots of atrophic retina demonstrated that the retina had been replaced by fibrous tissue. The optic nerves showed marked atrophic changes. There were no lesions in the choroid.

Semon and Wolff[12] examined the fundi of a patient with acute lupus during the last few weeks of life. In the fundus of the right eye they found a small, round, white, elevated lesion situated underneath a retinal vein, just below the disc. A similar lesion subsequently appeared in the left eye and two others in the right eye. The edges of both discs became slightly blurred, but there was no actual swelling. Pathological examination of the right eye showed a round-cell infiltration of the choroid, with a partially organized subretinal exudate of inflammatory cells at the site of one of the lesions observed ophthalmoscopically. Only post-mortem changes were noted in the retina. The left eye was not examined histologically.

Jarcho,[13] in a review of all the cases of acute fatal lupus at the Johns Hopkins Hospital up to 1936, mentioned the retinal lesions found in one of the cases reported in this paper (case 1).

Kurz[14] reported a case of acute lupus in which phlyctenulalike nodules appeared in the conjunctiva 14 days before death. Ophthalmoscopic examination at this time revealed several small white lesions lying over the retinal vessels in the macular area of the left eye, with a few small retinal hemorrhages scattered about the posterior fundus. Two days later lesions of the same type appeared in the right eye. On histological examination of the left eye a group of cytoid bodies and some small hemorrhages were found in the nerve-fiber layer of the retina. Several subepithelial foci of round cells and polymorphonuclear leukocytes were found in the bulbar conjunctiva.

The various manifestations of acute disseminated lupus erythematosus are as yet not fully understood, nor have all the clinical findings been satisfactorily correlated. The diagnosis is therefore always subject to some question. In view of this fact the following five cases are reported in considerable detail. The histological descriptions are grouped together at the end of the case reports because of the similarity of the ocular lesions in every case.

Case histories

Case 1. M. B., a white female, at the age of 18, in September, 1932, developed on her back some dark-red papules which subsequently ulcerated. During the next three months the lesions spread to her hands and face, and she began to complain of generalized malaise. She was admitted to the wards of the Johns Hopkins Hospital on December 8, 1932. Physical examination at that time revealed a red, nonblanching, confluent facial lesion with a butterfly distribution, extending over the bridge of the nose into the anterior nares and the external auditory canals. Numerous elevated punctate lesions, many of which had eroded tops, were present over the palms and backs of the hands and distal phalanges. Over the back, assuming the outline of the area not protected by a bathing suit, were red papules with scaly tops. Eroded lesions the size of a pinhead were found on the hard palate, but none on the buccal mucosa. The heart and joints were normal. The blood pressure was 120/80. *Examination of the fundi showed no abnormalities.* Further clinical examination of the patient during her stay in the hospital revealed the following significant findings: a slight normocytic anemia (R.B.C. 3.5 million. Hbg. 11.4 gm. per 100 c.c.); a slightly elevated temperature which spiked irregularly to 102°F.; a real leukopenia of around 3,000 W.B.C. (normal differential count) which persisted throughout the illness, except for a terminal elevation of 14,500 W.B.C.; a negative blood culture 15 days before death, and a growth of pneumococcus type II on the day of death; a positive reaction to 1/100 mg. of old tuberculin intracutaneously; normal urinary examinations except for slight traces of albumen and a few granular casts, with specific gravities from 1.008 to 1.022;

moderate accentuation of the peribronchial markings in both lungs, with heart and aorta normal size (roentgenoscopic examination); negative blood Wassermann reaction; normal nonprotein nitrogen of around 32 mg. percent throughout the illness; and a phenolsulphonphthalein-excretion test of 90 percent in two hours. During the patient's stay in the hospital there was a progressive spread of the skin lesions. On January 8, 1933 (four days before death), she had a clonic convulsion lasting several minutes, followed by excitement and blindness for several hours. Examination of the

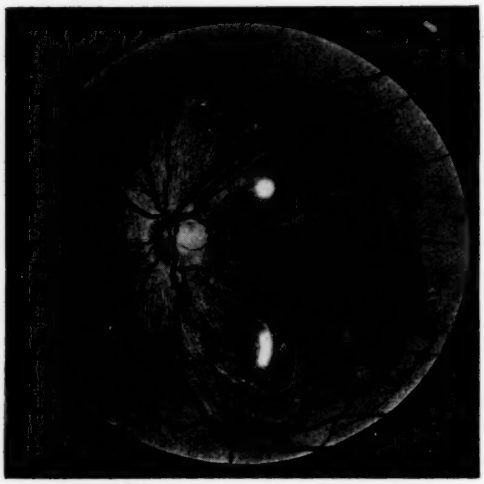

Fig. 1 (Maumenee). Drawing of the fundus of the left eye, made one month before death, showing two areas of cytoid bodies in the retina. Case 2.

spinal fluid at this time revealed no abnormalities. *Her pupils reacted normally to light, and the extraocular movements were normal. The right fundus was normal. In the left eye there was a small, fluffy-white retinal lesion bordered by a small superficial hemorrhage. The following day two more fluffy-white spots were noted in the retina of the left eye, and several similar lesions had appeared in that of the right eye. A few additional superficial hemorrhages were found in the fundus of the left eye, but not related to the white spots. Both discs were slightly edematous and the vessels of both retinae were hyperemic. The vision in each eye at this time was grossly normal.* The patient developed lobar pneumonia, with edema of the larynx, and died three days later. At no time did the blood pressure become elevated. Autopsy findings were: ulcerative stomatitis, laryngitis, and pharyngitis; diphtheritic esophagitis; confluent lobular pneumonia, left (pneumococcus type VI); septicemia (pneumococcus type VI); fibrinous pleurisy; focal necrosis of the spleen; subacute glomerulo-nephritis, slight; and lupus erythematosus disseminata.

Case 2. M. O., a white female, at the age of 37 years, in 1932, began to notice lassitude, fatigue, and recurring arthralgic pains in the upper back. During the next two years she lost 20 pounds in weight, but this may have been partly due to dietary restriction. In July, 1934, several small pimples appeared on the right cheek. Within the next seven weeks the lesions slowly spread and became confluent, covering the right cheek and extending across the nose onto the left cheek. Similar lesions appeared on the chin and the forearms. There was an exacerbation of the joint pains and an additional loss of six pounds. The patient was admitted to the wards of the Johns Hopkins Hospital on August 19, 1934. Physical examination showed a rather slight female not seriously ill. There was a little pitting edema of the ankles. Over the cheeks, nose, chin, and forehead there was a diffuse copper-colored eruption, slightly indurated, not tender or hot. The eruption was smooth over the cheeks and somewhat papular and blotchy over the forehead and chin. On the right forearm there were a number of small papular erythematous areas of the same color as the eruption on the face. The heart was normal. The blood pressure was 140/85. Nothing abnormal was found on neurological examination. There were no objective manifestations of joint disease to account for the arthralgic pains. During this hospitalization there was an exacerbation of the skin lesions after the patient was accidentally exposed to the sun for one-half hour. She improved and was discharged. During the next nine months she was readmitted to the hospital three times because of exacerbations of the skin lesions. On each subsequent admission she was noted to be more emaciated and to have more extensive skin lesions. She entered the hospital for the fourth and last time in April, 1935. By this time the skin lesions had spread over almost the entire body. The conjunctivae and mucous membranes of the mouth were diffusely reddened, and there was a swelling of the lids. She was found to have bilateral hydrothorax (confirmed by X-ray studies) and a short systolic apical murmur. The blood pressure was 140/90. Additional clinical findings during the four admissions were as follows: a slight anemia (R.B.C. 4.00 million, Hbg. 11 gm. per 100 c.c.); a persistent elevation of temperature between 100°F., and 101°F., which spiked occasionally; a relative leukopenia of 6,000 W.B.C. (normal differential) except for a terminal elevation in the last two weeks to 12,000 W.B.C.; partial clouding of the right antrum and both ethmoids due to chronic infection (X-ray diagnosis); faint traces of albumen and occasional granular casts in the urine, with specific gravities

from 1.010 to 1.028; a phenolsulphonphthalein-excretion test on two occasions of 80 percent and 74 percent in two hours; normal nonprotein nitrogen of around 30 mg. percent throughout the course; negative aerobic and anaerobic cultures, and negative guinea-pig–inoculation test for tuberculosis with pleural fluid; negative blood cultures; clotting time six and one-half minutes, clot retraction time three hours, bleeding time one to two minutes, and normal tourniquet test; and a negative blood Wassermann reaction. During the last three months of the patient's illness she was frequently disorientated and irrational. On September 19th, she lost consciousness for several minutes and was not able to speak for 30 minutes thereafter. No other neurological signs could be elicited. *Ophthalmoscopic examination at this time showed slight blurring of the nasal sides of the disc, with slight generalized subretinal edema. In the right fundus there were three very minute superficial retinal hemorrhages between the disc and the fovea. About one-and-a-half disc diameters slightly above and temporal to the nervehead, and in relation to the superior temporal vessels, was a fluffy-white patch of exudate with ill-defined serrated edges. Another similar patch, a fourth the size of the disc, was seen near the limit of vision in the lower temporal quadrant. In the left eye two similar spots of exudate were found near the disc, related to the blood vessels. No hemorrhages were seen in the fundus of the left eye (see figure 1).* The patient developed pneumonia on November 14th, and died two days later. Autopsy findings were: inflammation and widespread hyalinization of the small arteries and arterioles in the liver, gall-bladder, colon, pancreas, kidneys, heart, brain, knee, and vertebrae; nonbacterial vegetations of the mitral valves; scars and an area of necrosis in the myocardium; mural thrombus in the left ventricle; infarct in the kidney; areas of encephalomalacia; minute thrombi in the cerebral vessels; subacute glomerulo-nephritis; lobular pneumonia; hyperplastic bone marrow; extensive pleural and pericardial adhesions; and lupus erythematosus disseminata.

Case 3. G. B., a white male, at the age of 29 years developed a sore throat and swelling of the glands in the neck and axillae. The sore throat disappeared in a short while, but the glandular enlargement persisted, and one gland in the right axilla ulcerated. About a year and a half later, in December, 1937, tonsillectomy and biopsy of one of the glands in the neck were performed at the Church Home Infirmary. Sections of the gland showed tuberculosis. Five months after this the patient suffered a severe sunburn, and the skin on his ears and nose became red and itchy. During the following two months the redness spread over his face and onto his neck. In the latter two weeks of this period he had "feverish spells" and orthopnea. The patient was admitted to the wards of the Johns Hopkins Hospital on July 15, 1938. Examination at that time revealed a scaling, erythematous, confluent, papular, itchy skin lesion over the face extending in a butterfly distribution to the ears and to the upper part of the neck. There was a blotchy redness of the soft palate. The glands in the neck were enlarged and there was a discharging mass in the right axilla. A soft precordial systolic murmur could be heard, loudest in the pulmonic area. The blood pressure was 130/50. Examination of the chest disclosed chronic fibroid pulmonary tuberculosis at the apices, and pleural thickening at the bases. This was confirmed by roentgenogram. The edge of the liver could be felt four finger breadths below the costal margin. *Ophthalmoscopic examination of the fundus of the right eye revealed three grayish patches of exudate without hemorrhage about one disc diameter temporal to the disc at the nine-o'clock position. These exudates were thought to lie over the smaller arteries. The fundus of the left eye was normal.* Further clinical examination revealed the following notable findings: a slight normocytic anemia (R.B.C. 3.4 million, Hbg. 9.5 gm. per 100 c.c.); an irregular elevation of temperature between 100 and 104°F., becoming progressively more elevated; a relative leukopenia of around 5,700 W.B.C. throughout the patient's course; marked albuminuria, with many red blood cells and white blood cells and moderate number of granular casts in the urine with specific gravities from 1.010 to 1.022; a phenolsulphonphthalein test of 30 percent in two hours; a mass on the right side just below the kidney, with destruction of the eleventh and twelfth thoracic vertebrae (confirmed by roentgenogram); repeatedly negative blood cultures, including cultures for tuberculosis; staphylococci and streptococci in cultures from the axillae; and negative sputum examinations. During his stay in the hospital the patient's condition steadily grew worse. *He developed fresh hemorrhages near the discs in both eyes, but not related to the white exudates. No changes were noted in the discs.* The eruption on his face gradually spread and finally involved the whole of his face, his trunk, and his groins. The nonprotein nitrogen gradually rose, reaching a peak of 72 mg. percent shortly before death. He was stuporous during the last few weeks of life, and from time to time delirious. He finally died of an apparently overwhelming toxemia. His blood pressure was never elevated. Autopsy findings were: fibrocaseous tuberculosis with bilateral cavities; tuberculous erosion of the eleventh and twelfth vertebrae and intervertebral discs; right psoas abscess; tubercles in spleen; nonbacterial vegetations on the tricuspid, pulmonary, and mitral valves; metaplasia of the pancreatic-duct

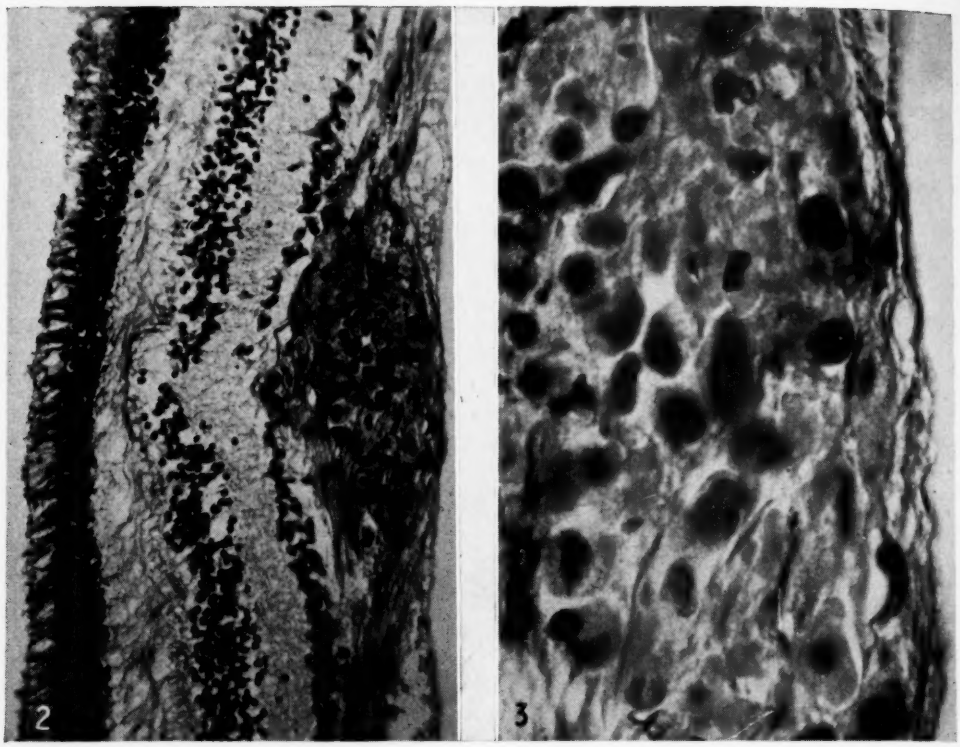

Fig. 2 (Maumenee). Large group of cytoid bodies in the nerve-fiber layer of the retina. Case 3. Hematoxylin and eosin stain (× 200).

Fig. 3 (Maumenee). Higher magnification of the group of cytoid bodies in figure 2. Hematoxylin and eosin stain (× 725).

epithelium; hyperplasia of the femur marrow; old pericardial, pleural, hepatic, and splenic adhesions; calcified hilar lymph nodes; glomerulo-nephritis; and lupus erythematosus disseminata.

Case 4. G. G., a white male, began to have intermittent pain and swelling of the joints at the age of 32 years. Eighteen years later, seven weeks before admission, he developed a mild cough, night sweats, slight elevation in temperature, and exacerbation of the joint pains. Shortly afterwards he developed a discrete papular rash on his face, which later became confluent. During the following month and a half he lost 50 pounds in weight. He was admitted to the wards of the Sinai Hospital on June 1, 1939. On examination there were large confluent, maculopapular, port-wine lesions on his face. On his trunk and upper limbs were scattered similar well-defined erythematosus lesions of varying sizes and shapes. There was a soft systolic murmur at the apex. Blood pressure was 120/80. There were evidences of pleural effusion at the right base (confirmed by X-ray studies). *On ophthalmoscopic examination the media were clear. The nasal sides of the discs of both eyes were blurred. In the fundus of the right eye, in the inferior temporal quadrant, were noted several, small, irregular, yellowish-white, elevated spots not related to vessels. Two similar lesions were noted in the fundus of the left eye between the disc and the macular area. No hemorrhages were seen in either fundus. (The observer thought the lesions were miliary tubercles.)* Further significant clinical findings were: a slight normocytic anemia (R.B.C. 3.65 million, Hbg. 9 gm. per 100 c.c.; an irregular elevation of temperature between 100°F. to 103°F.; a persistent real leukopenia of about 4,000 W.B.C., with a normal differential; two colonies of B. pyocyaneous per cubic centimeter in a blood culture taken on July 2d; normal spinal fluid, including culture; negative guinea-pig–inoculation test for tuberculosis with pleural fluid; a slight trace of albumen in the urine with a few granular casts, with specific gravities from 1.010 to 1.020; negative intracutaneous tuber-

culin test to 1 mg. O.T.; and a normal blood urea. The blood pressure rose as high as 160/100 on a single occasion. The patient developed pneumonia on July 10th, and expired a few days later. Autopsy findings were: chronic fibroid tuberculosis of the left apex with cavity formation; bronchopneumonia, right lobe; area of necrosis in myocardium; glomerulo-nephritis; and lupus erythematosus disseminata.

Case 5. I. I., a colored female, at the age of 27 years developed several small pimples under her eyes. At this time she was admitted to the Provident Hospital with an attack of acute arthritis. The arthritis gradually subsided entirely. During the succeeding five years a skin lesion originating with the pimples under the eyes spread across her nose. She was first seen in the Johns Hopkins Hospital on June 28, 1937, at the age of 32 years. Physical examination at this time was essentially normal except for a butterfly-shaped lesion of atrophic skin, with irregular pigmented scars, extending over the bridge of the nose back to the ears. During the following year and a half the patient was given 63 injections of gold sodium thiosulfate (25 mg. in each injection). The only change noted in her condition during this time was a gradual spread of the skin lesion on her face. In December, 1938, she developed a severe hemolytic streptococcus sore throat. Following this she began to lose weight, to have night sweats, and to have nocturia. She was admitted to the wards of the Johns Hopkins Hospital on April 3, 1939. Clinical examination during her stay in the hospital revealed, in addition to the skin lesion of the face, the following essential features: small pigmented, slightly raised papules and atrophic areas scattered over the back, chest, and arms; infiltration of the left lung extending out from the hilus and slight enlargement of the heart (confirmed by X ray); blood-pressure 145/90; moderate general glandular enlargement; moderate normocytic anemia (R.B.C. 2.8 million, Hbg. 6.8 grams.); an irregular elevation of temperature between 100°F. and 104°F.; a slight elevation of the W.B.C. of around 8,000 except for a terminal elevation to 17,000; albumin in the urine, varying from none to 4+, with urinary specific gravities ranging from 1.010 to 1.020; negative reaction to intracutaneous injection of 0.01 mg. of old tuberculin; bleeding time 1.5 minutes and clotting time 13.5 minutes; negative blood Wassermann reaction; blood nonprotein nitrogen 30 mg. percent; with a terminal elevation to 72 mg. percent; and negative aerobic and anaerobic blood cultures on four occasions. Biopsy of an axillary lymph node revealed caseous tuberculosis, and a guinea pig inoculated with material from this node developed tuberculosis. The patient gradually lost weight. On April 27th, she became disorientated and developed signs of meningeal irritation with more pronounced elevation of the temperature (to 104°F.). Lumbar puncture and spinal-fluid examination at this time showed nothing abnormal. *External and ophthalmoscopic examination of the eyes at the time of admission disclosed no abnormalities. Reëxamination of the eyes immediately after signs of meningeal irritation appeared revealed definite papilledema in both eyes with a patch of fluffy-white exudate in the upper temporal quadrant of the fundus of the right eye.* The patient died nine days after exhibiting the first signs of meningeal irritation. (Sulfanilamide was given during the last four weeks of illness in dosage sufficient to maintain a blood concentration of approximately 8 mg. percent.) There was never any appreciable elevation in the blood pressure. Autopsy findings were: caseous bronchial lymph nodes; microscopic caseous tubercles in splenic vein; miliary caseous tubercles in lungs;

Fig. 4 (Maumenee). Area of hemorrhage and exudate in the stroma of the choroid. Case 2. Hematoxylin and eosin stain (× 250).

fibrinous pleurisy; glomerulo-nephritis; and lupus erythematosus disseminata (clinical).

Histological examinations of the eyes

The posterior halves of the eyes from each of the reported cases were obtained for post-mortem study within a few hours after death. The specimens were fixed in Bouin's solution and imbedded in paraffin. Sections were cut at a thickness of 7 micra and stained with hematoxylin and eosin and Verhoeff-van Gieson stains. In several of the cases there were slight post-mortem changes in the retina of which no further mention will be made. As already mentioned, all the eyes showed essentially the same histological picture.

The yellowish-white to white spots seen with the ophthalmoscope (see figure 1) were found to be typical areas of cytoid bodies in the nerve-fiber layer of the retina (see figures 2 and 3). One or more groups of cytoid bodies were found in every case. The sizes of these lesions varied from a few globular elements that caused no localized elevation of the hyaloid membrane to areas about 1 mm. in diameter and almost double the thickness of the nerve-fiber layer. Three of the lesions were noted to be in the proximity of retinal vessels but none touched a vessel. A few red blood cells were found at the edges of two of the lesions, but in no instance were the areas related to large hemorrhages. In two cases very small hemorrhages were seen among the inner fibers of the nerve-fiber layer. Slight papilledema was histologically evident in case 2 and moderate papilledema in case 5. Only in case 2 were any notable changes found in the retinal vessels, in which case there was a slight hyaline degeneration of the intima of the retinal arteries typical of arteriolar sclerosis. No hemorrhages nor exudates were found in the nuclear or plexiform layers of the retina. The ganglion cells appeared to be normal. There was no subretinal exudate in any of the cases. A slight round-cell infiltration of the choroid, "septic choroiditis,"[15] was present in all five cases. In case 2 there were serous exudates and hemorrhages in the stroma of the choroid extending about two to three disc diameters out from the optic nerve (see figure 4). The choroidal vessels in this case exhibited a moderate hyaline degeneration of the intima and a proliferation of the adventitia. No remarkable changes in the choroidal vessels were found in the other cases. There was no atrophy of the optic nerve in any specimen. The whole eyes were obtained for study in only one case (case 4). No abnormalities were found in the anterior segments from this case.

Comment

In reviewing the foregoing cases it is seen that all except one of the patients had the typical skin lesions of acute lupus erythematosus disseminata. Case 5 is tentatively classified as chronic disseminated lupus because there was no flare-up of the skin lesion prior to death and because the only systemic manifestation not readily explainable as a result of the disseminated tuberculosis was a glomerular nephritis. A slight anemia and an irregular elevation of the temperature was noted in every patient. Glomerular nephritis occurred in every patient, but there was never an elevation in the blood pressure. A real or relative leukopenia was present in four patients, except for a terminal elevation in the white blood cells. Three patients had cardiac involvement—one with both nonbacterial vegetation of the valves and myocarditis, one with vegetations only, and one with myocarditis only.

Ophthalmoscopic and histologic exam-

ination of the fundi of these five patients revealed the presence of the following types of lesions: (1) Small, fluffy, yellowish-white to white spots located in the superficial layers of the retina, never larger than the size of the disc, usually in the posterior part of the fundus, very similar in appearance to the "cotton-wool" spots seen in hypertensive retinitis. In one patient the lesions were thought to represent miliary tubercles of the choroid. In every instance these areas were noted after an exacerbation of the general symptoms, and in three of the patients only after the appearance of cerebral manifestations. Histologically these lesions were demonstrated to consist of typical cytoid bodies in the nerve-fiber layer of the retina. This type of lesion was found in all five of the patients. (2) Small superficial retinal hemorrhages, related neither to the larger retinal vessels nor to the white spots. This type of lesion was noted in three of the five patients, appearing at the same time as the white spots. Histologically, these hemorrhages were found to be in the nerve-fiber layer of the retina. (3) Slight papilledema, never of sufficient degree to allow actual measurement of an elevation of the disc. This papilledema was observed ophthalmoscopically in three of the patients at about the time of appearance of the retinal lesions. A diagnosis of papilledema could be made histologically in only two of these cases. (4) A slight generalized blurring of the choroidal reflex believed to represent subretinal edema. This blurring was noted shortly before death in one patient. Histologically, there were some serous exudates and hemorrhages in the choroid of both eyes from this patient. (5) "Septic choroiditis." This condition could not be detected ophthalmoscopically, but was noted on histological examination as a slight round-cell infiltration of the choroid in every case.

The ophthalmoscopic appearance of the principal retinal lesions in some cases of lupus can be mistaken for that of miliary tubercles of the choroid. Bergmeister[7] and Pillat,[9] respectively, have classified the lesions as metastatic tubercles in the retina and as acute tuberculous choroiditis. Their convictions as to the tuberculous nature of the lesions were so strong that they offered the ocular findings as further proof that lupus erythematosus is due to a tuberculous septicemia. Since there were no histological examinations in their cases, it is impossible to refute absolutely their conclusions. However, from Bergmeister's ophthalmoscopic descriptions and the fact that he localized the findings in the retina it seems most probable that the lesions in his case were the same as those observed here. In case 4, reported in this paper, a competent ophthalmologist mistook the retinal lesions for miliary tubercles of the choroid. The differentiation of these two fundus lesions is of some diagnostic importance, for the question occasionally arises as to whether one is dealing with a patient with acute lupus or a patient with miliary tuberculosis with an unrelated skin eruption.

The retinal lesions reported in this paper cannot be accounted for on the basis of a hypertensive retinitis, for in no case was there a sufficient elevation in the blood pressure nor a sufficient hyalinization of the retinal vessels to explain these lesions. Moreover, the fluffy-white areas, cytoid bodies, should not be regarded as pathognomonic of acute lupus erythematosus, but rather as another manifestation of a generalized toxemia. This idea is supported in the cases observed here by the appearance of the retinal lesions only after the patients developed rather marked systemic manifestations. There are also cases in the literature in which fresh retinal lesions

have occurred after marked activation of the skin rash. The occurrence of cytoid bodies in the nerve-fiber layer of the retina in a generalized toxemia is not a new observation. Roth,[16] in 1872, was the first to ascribe these bodies as being manifestations of a generalized septicemia. Since that time, however, they have been found in the retina, not uncommonly, and in other conditions such as: hypertension, leukemia, increased cerebrospinal pressure with papilledema, optic neuritis, and lacerations of the retina.[17] Verhoeff[18] described groups of bodies, similar to those seen in the retina, within gliomas of the optic nerve and brain. He has been able to conclude, because of their appearance, position in the gliomas of the optic nerve, and staining qualities that these areas are groups of swollen neuroglia fibers.

In spite of the fact that all of the patients presented in this series died within a short time after the appearance of the white, fluffy areas in the retina, these lesions are not prognostic of a fatal termination, but rather, as in bacterial endocarditis, an indication of a severe systemic reaction. Cases have been reported in which the retinal lesions cleared after an improvement in the patient's general condition.[19]

Summary

1. The case histories including postmortem examination of four patients with acute and one patient with chronic lupus erythematosus disseminata are presented. Ophthalmoscopic and histological findings in the eyes of these five patients consisted of: (a) cytoid bodies of the retina, with an ophthalmoscopic appearance of small fluffy-white areas. These areas developed in all cases before death. (b) Small superficial retinal hemorrhages, noted ophthalmoscopically in three cases, and only twice in histological studies. (c) Slight papilledema, diagnosed in three cases before death, but demonstrable in only two cases in histological preparations. (d) Slight round-cell infiltration of the choroid, "septic choroiditis." This type of choroiditis could be seen histologically in all cases. (a) Choroidal exudates and hemorrhages, found on histological examination in one case.

2. The cytoid bodies found in the retinae of these five patients on both clinical and histological examinations are not pathognomonic of lupus erythematosus disseminata, but are rather a manifestation of a severe generalized reaction that accompanies this disease.

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CONCERNING THE CHAMBER ANGLE*

II. Exfoliation of the zonular lamella and glaucoma capsulare

Harry S. Gradle, M.D.

and

H. Saul Sugar, M.D.

Chicago

Since the early descriptions of lamellar exfoliation, much has been learned of the anatomical and pathological aspects of this interesting condition. Its relation to glaucoma has been, and is yet, a matter of considerable controversy. In the American literature only 45 cases seen in this country have been reported: two by Bedell,[1] seven each by Alling[2] and Kirby,[3] three by Holloway and Cowan,[4] one by Waite,[5] three by Shapira,[6] and 22 by Irvine.[7] The authors have studied 51 cases in which this condition was found, and believe that a definite relationship to glaucoma exists.

Historically, the observations on this subject may be divided into three periods: First, a period of histologic studies of the normal lens capsule; second, a period of clinical observation of cases of lens luxation and glass-blowers' cataract; and third, a period of clinical and histological studies on cases of senile exfoliation of the zonular lamella and glaucoma capsulare.

Early studies on the lens capsule were made by Arnold (1832)[8] and Kessler (1871).[9] In 1882 Berger[10] showed, by means of a potassium-permanganate maceration method, that the capsule is formed of two or three lamellae. He observed that the fibers of the zonule of Zinn run to the outer lamella of the capsule, and called this layer the zonular lamella.

Becker[11] and Schwalbe[12] carried on the idea of separation of the capsule into two layers. Fuchs,[12a] in 1883, observed in cases of iridocyclitis a differentiation of the capsule into two or three lamellae and believed that leukocytes in an exudate surrounding the lens might penetrate into the interlamellar clefts. In 1894 Retzius[13] found at the equator of the lens a minutely scalloped, raised membrane into which the zonular fibers were inserted. He believed it to be different from the rest of the capsule and that it was raised by the traction of the zonule fiber. He called it the membrana pericapsularis. Damianoff[14] in 1900 stated that he believed this membrane to be the atrophic remnant of the tunica vasculosa lentis into which the zonule fibers were inserted. The first histologic description of the capsule was made in 1902 by von Ebner.[14a] Bach,[15] in 1914, made further histologic demonstrations. In 1922 Beavieux[16] found that the capsule was thicker in the equatorial and peri-equatorial regions because of the membrane into which the zonule fibers are inserted. He differentiated the capsule into an inner layer, consisting partly of ectoderm and partly of mesodermal remnants of the tunica vasculosa lentis, and an outer ectodermal layer limited to the equatorial and peri-equatorial regions and disappearing toward the poles.

Busacca[17] in 1927 used silver impregnation methods, and found, all around

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the capsule, a thin lamella that showed fibrillar structure in the equatorial and peri-equatorial regions and became thinner toward the poles. In addition to the fibers inserted into this lamella, some bundles also penetrated it to terminate in the inner part of the lens capsule. Vogt[18] in 1932 described sections made from five globes of three normal humans to show similar deep insertions of the zonule fibers. The lamella also showed parallel striations concomitant to the directions of the zonule fibers everywhere except in the axial portion.

The second historical period began with the clinical study of cases of ectopia lentis and traumatic lens luxation in an article by Meesmann[19] in 1922. He noted the appearance of thickening and opacity of the remaining untorn zonule fibers and the presence of stumps of torn fibers in the equatorial region of the lens. He also observed a membranelike separation of the lamella at the equator in a traumatic case, and believed that the lamella was present in the equatorial and peri-equatorial regions only. Stein[20] and Jess,[21] in studies of cases of lens luxation, agreed with Meesmann. In Jess's case a particle of copper had penetrated into the eye. The zonule fibers and the lamella, only, were stained green. He therefore considered the lamella related to the zonule fibers. Cattaneo[22] studied a case of spontaneous lens luxation in which a membrane was present near the lens equator. He believed it to be the zonular lamella. Elschnig[23] in 1922 and Kubik[24] in 1923 observed ruptures of the zonular lamella in glass-blowers. These ruptures occurred at the anterior polar portion of the capsule and established the fact that the zonular lamella does not disappear at the anterior pole. Similar observations on glass-blowers were made by Kraupa,[25] Goulden,[26] Löwenstein,[27] Rotter,[28] Schnyder,[29] Weill and Levy,[30] Cords,[31] S. J. Meyer,[32] and Heischer.[33] Szillinsky[34] saw a case of injury to the anterior capsule in which lamellar tags were visible, but later were resorbed, and the capsule healed over. He concluded that since the lamellar material was resorbed, any material on the lens which was not absorbed could not be lamellar in origin. He referred, of course, to capsular exfoliation.

The third period—during which our knowledge of senile capsular exfoliation and glaucoma capsulare evolved—began in 1917 with Lindberg's[35] description of bluish-white flakes on the pupillary border. Vogt[36] described an example of this condition in 1921 as a pupillary-membrane remnant. In 1923 he described[37] flakes on the pupillary border and a central capsular disc in a patient who had been operated upon, but regarded them as due to exudation. In the same year Malling[38] noted changes in the anterior capsule in 40 percent of compensated glaucoma cases, and concluded that there must be some relation between the two.

In 1925 Vogt[39] gave a splendid description of the clinical picture of cases of what he now called "exfoliatio superficialis capsulae anterioris." He considered the probability of its being a result of glaucoma. His description included pupillary-margin flakes, capsule changes, and precipitates of exfoliated material on the posterior corneal surface. In 1926 he reported[40] on 17 patients, 13 of whom had compensated glaucoma. He suggested, then, that the exfoliated material was probably also present in the chamber angle and gave rise to glaucoma by choking up the outlets for the aqueous humor. He named the glaucomatous condition glaucoma capsulo cuticulare or glaucoma capsulare. This name has, unfortunately, been used by many authors to designate all cases of exfoliation, with or without glaucoma.

In the many reports that followed

Vogt's, various arguments were advanced as to the nature and cause of the capsular changes and their relation to glaucoma.

Handmann[41] and Schieck[42] believed that the pigmented epithelium of the posterior-iris surface, as a result of degeneration, adhered to the anterior lens capsule where it proliferated to form a glass membrane. Blaickner[43] similarly considered the capsule changes as the result of proliferated pigment cells.

Busacca[44] held that the material on the lens capsule had nothing to do with the zonular lamella, but that it was a granular, membranelike precipitation of substances normally found in the aqueous. He believed these precipitates might lead to glaucoma. His views, which were based on sections of three globes, were refuted by Grzedzielski,[45] who showed, by sections of normal eyes, that the precipitates found on the capsule are artifacts that may be present in any fixed normal section.

Ascher,[46] believed that the capsular changes resulted from alterations in the aqueous due to glaucoma. Baumgart,[47] Caramazza,[48] and Malling[49] held that both the capsular changes and glaucoma result from the same cause; namely, vascular changes in the uvea.

Bedell[50] considered that there was only a coincidental relationship between capsular exfoliation and glaucoma. R. Bey[51] and Read[52] likewise believed that there is no relation between the two. Most other authors have agreed with Vogt that glaucoma capsulare is a direct result of capsular exfoliation, which is itself a senile degenerative process. Trantas[53] held that capsular lesions are but part of a generalized senile ocular degenerative process involving nearly all the other ocular tissues, especially the glass membranes and transparent media. He believed a similar alteration in the excretory channels for the intraocular fluids explained the tendency to glaucoma which is furthered by obstruction of the channels by capsular pellicles.

Glaucoma has been found in too high a percentage of cases of capsular exfoliation to be unrelated to it. Of 643 patients with capsular exfoliation reported in the literature, 355 were definitely shown to have glaucoma. Vogt found glaucoma in 75 percent of 45 patients with exfoliation; Busacca in 90 percent of 30 cases, and Trantas[53] in 33 percent of 42. Baumgart found it in 63 percent of a total of 43 cases, Garrow[54] in 80 percent of 10 cases, and Pletneva[55] in 71 percent of 31 cases of exfoliation. Grzedzielski[45] in 1931 reported that of 156 collected cases of capsular exfoliation, there were 90 with glaucoma. In his own series of 17, 12 were glaucomatous. Irvine found 25 cases of glaucoma in 40 with exfoliation seen here and in India. In the authors' series 59 eyes (37 patients) of 82 eyes with exfoliation showed glaucoma capsulare (72 percent). It must be remembered, however, that the latter cases are from a glaucoma clinic to which cases of capsular exfoliation were referred through courtesy. Probably many instances of capsular exfoliation without glaucoma in cataract patients are overlooked.

Haemmerli[56] reported an interesting observation on an eye with capsular exfoliation. In 1925 he found no evidence of increased intraocular tension. After continued observation, glaucoma began to manifest itself three years later. Horven[57] similarly knew of cases of capsular exfoliation in eyes which later became glaucomatous. In contrast to this evidence are the few cases with unilateral exfoliation and glaucoma, while the fellow eye showed no exfoliation. Trantas reported two cases of this sort, and Read, one.

The frequency of exfoliation in cases

of glaucoma has varied from 6 percent (Blaickner) to 89 percent (Horven). Lindberg found iris flakes in 50 percent of 60 cases of chronic glaucoma. Malling's figures were 40 percent, Busacca's 60 percent, and Baumgart's 49 percent. Vogt found exfoliation in 7 percent of primary glaucoma cases and 8.6 percent of chronic simple glaucoma cases. Horven even went so far as to hold that glaucoma capsulare and glaucoma simplex must be regarded as identical. The authors found 37 cases of glaucoma capsulare in a total of 275 cases of primary glaucoma (13.5 percent). Distinction has been made by the authors between cases of primary exfoliation resulting in true glaucoma capsulare, and secondary capsular exfoliation in glaucomatous patients. Two cases of the latter were found in our group. In each instance a fine central disc was present on the anterior capsule in an eye in which glaucoma had been known to have been present for a long time—50 years in one case. No capsular material was present on the iris. The discs were so fine that unquestionably they were secondarily formed and only coincidentally associated with the glaucoma. One patient was 84 years old, the other 80.

Nearly all of the cases of glaucoma capsulare reported in the literature have been considered in the group of compensated glaucoma. The exceptions have been few. Busacca,[44] Foster,[58] and Theobald[59] each reported one, and Garrow[54] two cases with congestive attacks. Of the authors' patients, one had had bilateral iridectomies for acute glaucoma. Another was first seen during an acute episode. The very nature of the compensated glaucoma that occurs from capsular exfoliations is such that acute exacerbations of hypertension may occur only in the later stages of the condition. When acute incompensation does occur in any other stage, it is a coincidental incidence of the causative factors of the former together with the presence of the exfoliated material.

Another frequent association of capsular exfoliation is the presence of cataract, usually of the nuclear type. Lindberg found 28 cases of capsular exfoliation in 142 patients with cataract (20 percent). Busacca found 7 instances in 30 cataract patients (23 percent), Bey[60] 17 in 44 cataractous eyes (39 percent), and Horven 10 in 55 cataract patients (18 percent). Irvine found 18 cases of exfoliation in 235 with cataract (8 percent) seen in Madras, India. In the authors' group cataracts associated with vision of 20/200 or less were found in 31 of 82 eyes with capsular exfoliation (38 percent).

The relation between senility and capsular exfoliation seems to have been established by the fact that in only a comparatively few cases has the condition occurred before the age of 60 years and, heretofore, only one reported under the age of 50. The youngest patient in the authors' group is a man of 41 years. Even he, however, has marked gerontoxon as evidence of premature senility. Of the remaining 50 patients, 4 are in the late fifties, 24 in the sixties, 18 in the seventies, and 4 in the eighties.

A few studies of the frequency of capsular exfoliation in senility have been made. Lindberg found 4 cases in a group of 60 elderly individuals (6.6 percent); Rehsteiner[61] found 4 in 238 inmates of a home for the aged—three of the four had glaucoma. Horven found 2 cases in 67 inmates of another home. Trantas found 42 cases of exfoliation in a group of 237 persons over 55 years of age, in 14 of which there was glaucoma. Baumgart found 17 cases in 522 sick individ-

uals between the ages of 57 and 81.

The only point which can be raised against considering senility as the direct cause of capsular exfoliation is the fact that many unilateral cases occur. The authors found 15 such cases in their series. In none of these could any evidence of exfoliation be found in the unaffected eye even after maximal dilation of the pupil.

In all probability, exfoliation of the lamellae starts primarily with the presence of microscopic or ultramicroscopic vacuoles within the lens capsule itself. It is likely that the disturbance in lens respiration due to senile changes in the osmotic power of the capsule is accompanied by cellular death and disintegration, leaving a space filled with fluid from the surrounding tissues. These vacuoles are ruptured by the continuous play of the posterior surface of the iris, producing the characteristic clinical picture. Should the iris be missing, as in the case of an operative coloboma, no exfoliation results.

Sex seems to play an etiologic role in capsular exfoliation. Of the reported cases in which the sex was stated, 169 were in males and 93 in females. The authors found the condition in 36 males and 15 females.

Race appears to play some part, as yet undetermined. No cases have heretofore been reported in the Negro. The authors found one case of glaucoma capsulare in a group of 70 Negro patients with primary glaucoma. This patient was not, however, a full-blooded Negro. Seventeen of the remaining 50 patients who manifested exfoliation were born in Mediterranean countries. Eight of these were Greeks. Perhaps there is some relation between the compartively large number of the latter and Trantas's finding of exfoliation in 18 percent of 237 Greek patients over 55 years of age.

Clinical picture and authors' findings

Capsular exfoliation itself is symptomless. The oculist is consulted because of the associated lens opacity or changes due to glaucoma. Even when the latter is present the visual loss is the chief complaint, usually. Of the authors' primary cases, four patients had noticed rainbow halos about lights and only two complained of ocular pain as an early symptom. One of the latter had had an acute glaucomatous attack. Three others had ocular pain when the eye was totally blind or nearly so. All the others complained of decreasing visual acuity.

The clinical picture of capsular exfoliation may be divided as follows:

I. Iris Changes

(a) *In the pupillary border:* These consist in a motheaten appearance of the pupillary border and the presence of a delicate bluish-white fuzzy material on the pupillary border.

(b) *Anterior surface:* Shreds of capsular material may be found on the anterior iris in the vicinity of the pupillary area and but rarely in one of the crypts on the anterior surface of the iris.

(c) *Posterior surface:* Exfoliated material may be seen along the edges of the coloboma where iridectomy has been performed and along the pupillary rim of the posterior surface of the iris when observed with the gonioscope. The pupillary-border changes are those most frequently seen, and thus usually first suggest the diagnosis of capsular exfoliation. They are not, however, present in every case, especially postoperatively. Vogt and Rehsteiner never saw pupillary masses without exfoliation of the capsule, although they stated the reverse can occur. Rehsteiner reported 6 of 17 cases in which capsular exfoliation occurred without pupillary masses. Bey found pupillary

masses in 41 of 44 eyes (24 patients). In the authors' primary exfoliation cases four affected eyes showed no pupillary masses. All, however, showed marked loss of pupillary border pigment.

II. Lens Changes

(a) *Anterior capsule:* The changes occur in five zones (see figure 1):

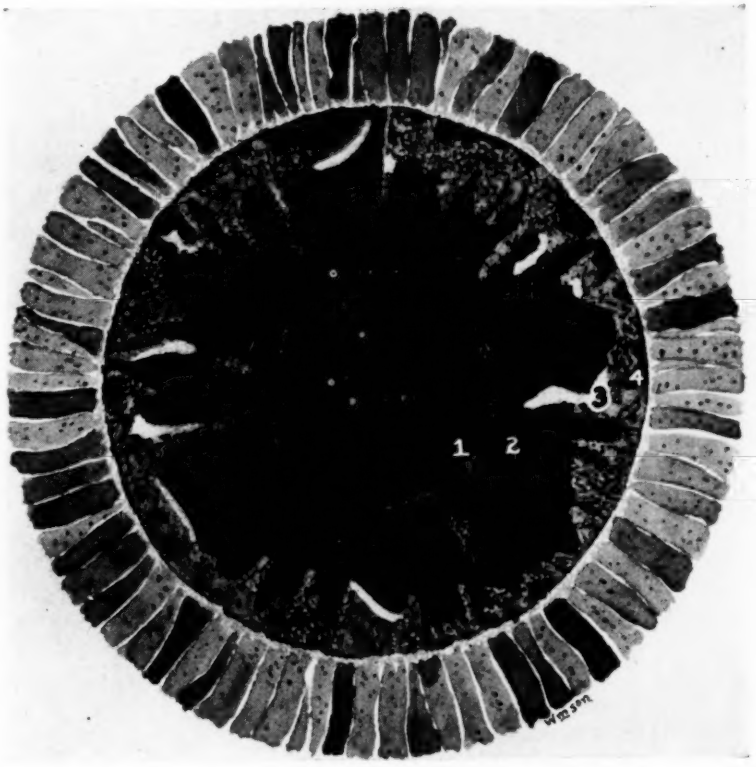

Fig. 1 (Gradle and Sugar). Drawing of capsular exfoliation in a 57-year-old man with glaucoma capsulare. 1, central disc; 2, intermediate clear ring; 3, granular zone; 4, peripheral clear zone; 5th zone concealed by iris.

(1) A central, translucent disc, the size of the smallest pupillary diameter. The borders are sharp and may curl forward if the lamella separates from the rest of the capsule. The disc may decrease in size if miotics are used for a sufficiently long time (Vogt). A few, minute, white specks are usually visible in the otherwise homogeneous disc.

(2) An intermediate ring, not always complete, where the movements of the iris have caused exfoliation of the translucent layers of the lamella, leaving a more or less clear zone, with radially serrated, sharp, granular borders. The radial projections are undoubtedly due to the configuration of the posterior iris surface. Müller,[62] in a case in which a preliminary iridectomy had been performed prior to the development of the exfoliation, showed that the iris movements are the cause of the intermediate clear zone. In his case the area exposed by the iridectomy showed only a translucent lamella, while a definite exfoliation was present in the region of the intact iris border. Wollenberg[63] added to this view in a case in which exfoliation was present in one eye which had an active pupil and none in the other eye in which the pupil was fixed.

Vogt and Trantas have observed that secondary exfoliation rings may occur where one layer has already been scraped off the capsule. This is to be expected since the lamella is made up of many thin laminae which are involved one after the other from the most superficial inward.

(3) A third granular zone which begins axially with a sharp serrated border and ends in less sharp but similarly serrated peripheral edge. The axial border of this zone may curl forward, as does the peripheral border of the central disc. The zone varies in extent with the amount of iris in contact with the lens. It appears that the granules are the result of vacuole-formation in the lamella (Vogt). Why they should be present in the zone in contact with the iris has not been determined. Perhaps the trauma of the moving iris is responsible. Garrow has suggested that the radial arrangement may be due to radial traction from the periphery. The authors believe it to be due to the radial furrows of the posterior iris surface, as was suggested by Vogt.

(4) A peripheral, clear, translucent zone which can be seen especially well through iridectomy openings. This zone shows striations peripherally where the zonule fibers become part of the lamella.

(5) An equatorial zone, between the anterior and posterior zones of insertion of the zonule fibers, where granules are again visible in the lamella. This area can be seen only with the gonioscope.

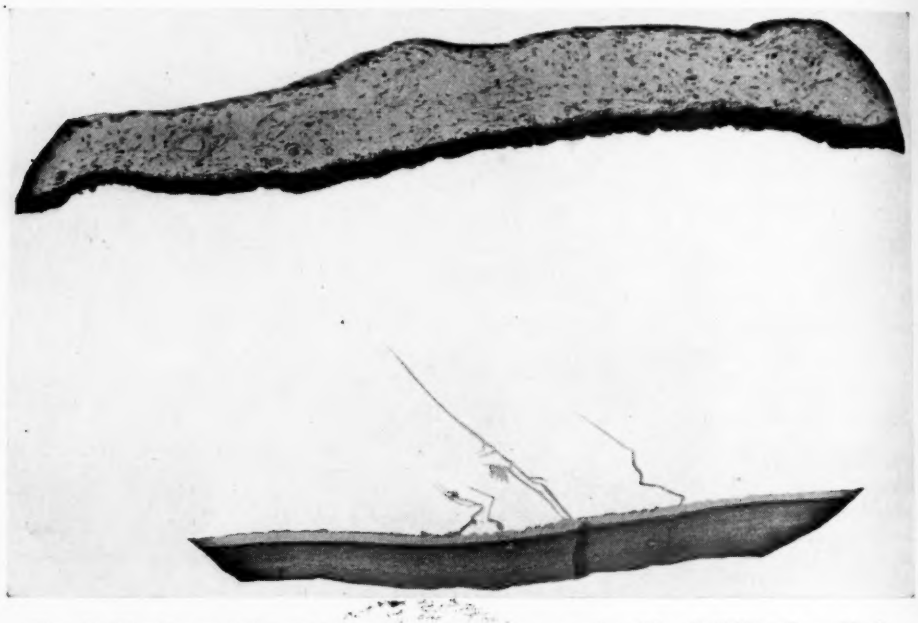

Fig. 2 (Gradle and Sugar). Exfoliation of lens capsule. (No. 7-10999. Case H. L. Courtesy of Dr. T. L. Terry.)

All the anterior capsule zones were not present in all cases recorded in the literature. Horven found no central disc in 10 percent of his cases. He states that the peripheral granular zone is the only one always found, while Trantas and Garrow found a great variation in the zones which were visible. It is difficult to see the periphery because of the resistance of the iris to pupillary dilatation in some of these cases.

(b) *Posterior capsule:* The authors

have seen striations in the extreme periphery of the posterior capsule in two cases in which iridectomy had been performed. No report of posterior capsular exfoliation has been made.

(c) *Lens substance:* Dense nuclear sclerosis and cortical opacities are common. Perhaps these may be the result of degenerative changes in the vitreous.

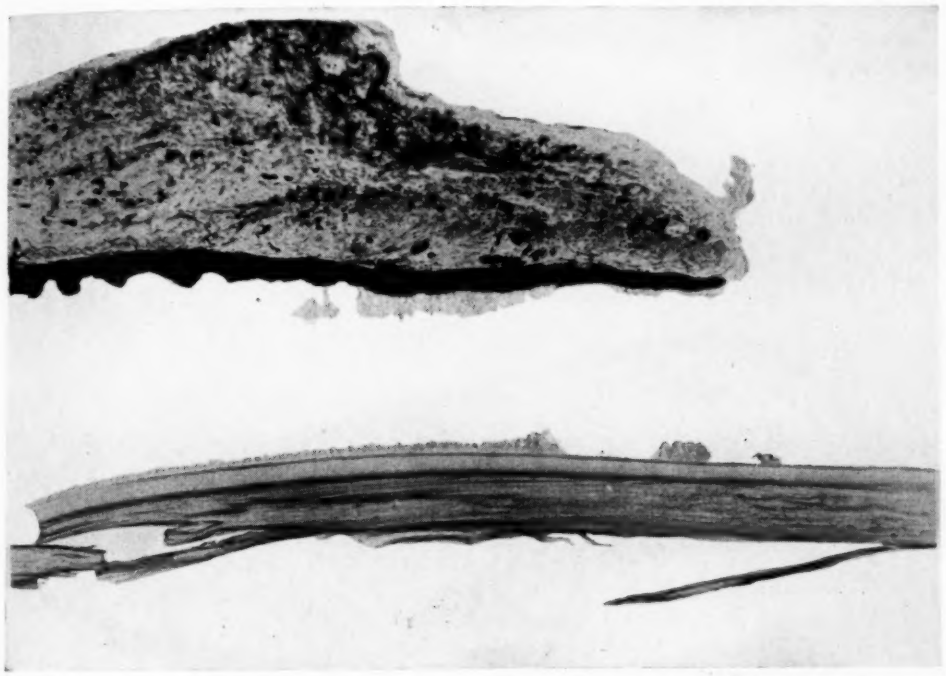

Fig. 3 (Gradle and Sugar). Exfoliation of lens capsule. (No. 7-11535. Case N.G. Courtesy of D. T. L. Terry.)

III. Zonule Fibers

Trantas (1926) first showed that the zonule fibers were affected in capsular exfoliation. Vogt made a similar observation in 1931. Horven (1936) stated that particles on the zonule fibers are present in every case. In 9 eyes of 9 of the authors' cases in which iridectomy had been performed, the fibers showed translucency and deposits of exfoliated material in every case. Ordinarily the zonule fibers are not easily seen by gonioscopy, but in these cases it could be very easily studied. Because of their degeneration, spontaneous lens dislocation may occur in advanced cases.

IV. Precipitates

These are seen on the ciliary processes when observed through iridectomy openings by means of gonioscopy.

V. Vitreous Changes

Because of the frequency of lens opacities, the vitreous is usually difficult to study. In 26 eyes in which the vitreous was visible, it was fluid in 25. In three of these synchysis scintillans was present. In only one case, considered to be early, were there no heavy strands of degenerated vitreous. In one unilateral case of glaucoma capsulare the vitreous was fluid in the affected eye and normal in the other. These findings seem to establish the fact

that capsular exfoliation is not alone a disease of the lens capsule, but involves the entire vitreous body and its derivatives, the zonule fibers, and zonular lamella.

VI. Anterior Chamber

Occasionally flakes of exfoliated material may be seen floating in the aqueous.

level of a 3-mm. pupillary border. These values are corrected by Hartinger's[64] formula and are comparable to findings in normal persons of the same age. Only 2 of 51 cases of exfoliation showed values indicating shallow chambers.

VII. Chamber Angle

The angle is always grossly open and

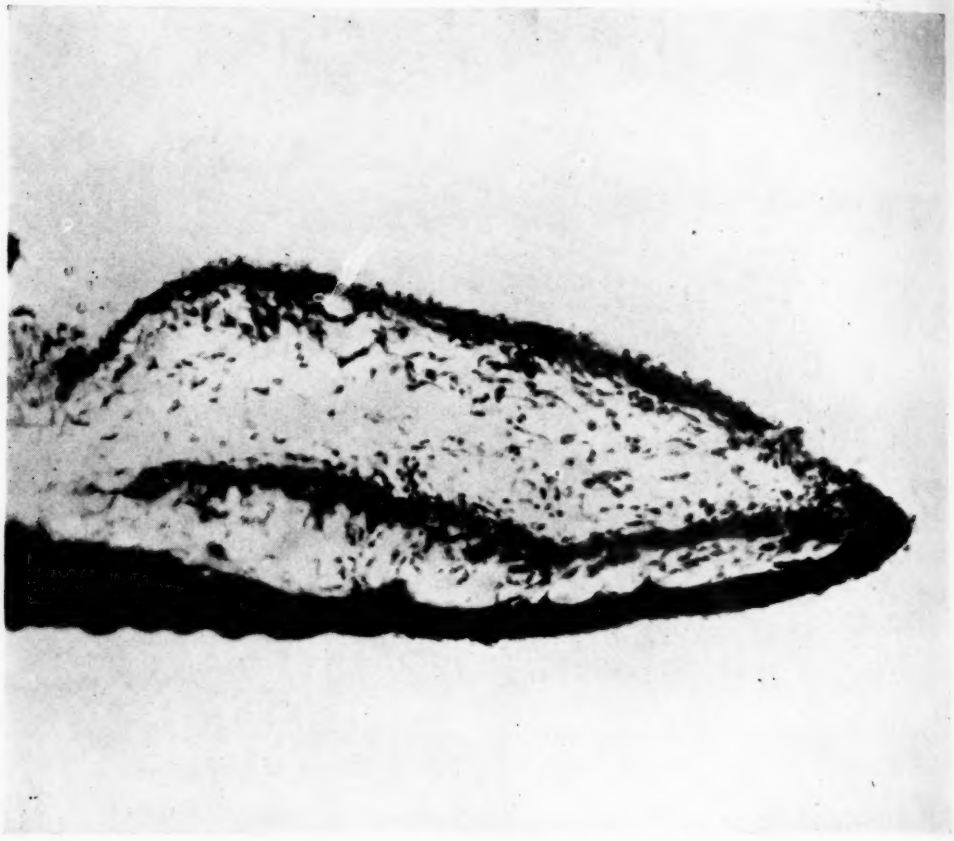

Fig. 4 (Gradle and Sugar). Dandruff on pupillary margin in glaucoma capsulare. (No. 6-9789. Courtesy Dr. T. L. Terry.)

A large flake was seen by the authors in one case.

The anterior-chamber depth is usually normal. Of 25 eyes measured with the Ulbrich drum, 23 had a depth averaging 2.11 mm. from the anterior corneal surface to the anterior iris surface at the

often has a veiled appearance, due to exfoliated material that is present. Barkan[65] was the first to note this exfoliated material in the chamber angle. In the authors' cases it was present in every case of primary exfoliation. Another constant finding is a trabecular pigment band in

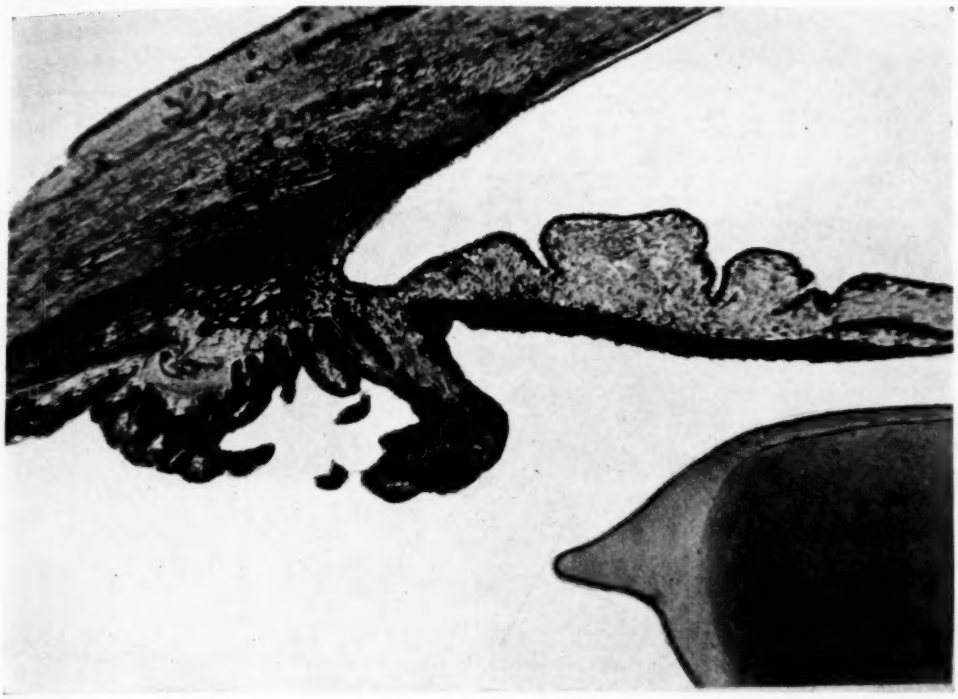

Fig. 5 (Gradle and Sugar). Exfoliated material on trabeculum in glaucoma secondary to exfoliation of lens capsule. (No. 6-9789. Courtesy of Dr. T. L. Terry.)

the zone of Schlemms' canal. In six unilateral exfoliation cases trabecular pigment was present only in the eye with capsular involvement, in every instance. This pigment is derived from the pigment epithelial degeneration at the pupillary border, which has been noted. The pigment is apparently deposited in the trabecular meshwork, and causes the bandlike appearance. The authors do not believe it plays an important part in the trabecular obstruction since the deposit is marked even in early cases without glaucoma.

VIII. Cornea

Precipitates of capsular material and very fine pigment dust on the posterior corneal surface may be observed in nearly all cases. Bey found pigment precipitates in 6 of 44 cases (13.6 percent). The authors found precipitates of both pigment and capsular material in 78 of 82 eyes.

When the signs of glaucoma are added to those of primary capsular exfoliation, the condition is designated as glaucoma capsulare. The condition is very slow in its development and often one eye is totally blind while the other is still unaffected by increased tension. In 12 of the authors' cases, one eye had an absolute glaucoma while the vision in the other was 20/30 or better. It is interesting to note that Bey found excavation of the disc with characteristic glaucomatous fields in patients who, after long observation, never showed any tension above normal but manifested definite differences between the tension of the two eyes. Maghraby[66] stated that the limits of normal in these cases are lower than in ordinary glaucoma. He believes a tension of 22 to 25 mm. Hg is high when as-

sociated with capsular exfoliation. One case in the authors' series seems to fit in with this idea.

Case: J. S., 71 years of age, was first seen in August, 1935, when his vision was R.E. light perception, L.E. 20/20. Tension was as high as 37 mm. Hg (Schiötz) in the right eye and never over 25 mm. in the left. Only a temporal island of visual field was present in the right eye. An iridotasis was performed on the right eye with normalization of tension. The visual field of the left eye showed gradual constriction and enlargement of the blind spot. The tension remained between 23 and 25 mm. Hg until an iridencleisis was performed. The fields have remained unchanged since the operation.

Fig. 6 (Gradle and Sugar.) Exfoliation of lens capsule with deposit on both surfaces of the iris. (Case N. G. Courtesy of Dr. T. L. Terry.)

The cause of the hypertension in glaucoma capsulare is failure of the function of the filtration angle. As the delicate capsular exfoliations break loose from the lens covering, they float freely in the aqueous and are, of course, carried with the aqueous currents. Regardless of the convection movements in the anterior chamber, the ultimate flow of the aqueous is toward the chamber angle. The capsular particles, carried by the current, finally lodge in the chamber angle. When caught on the anterior surface of the iris periphery, they apparently cause no disturbance. But when the exfoliated material, which is almost macroscopic, drifts against the posterior surface of the limbal area, that part of the trabeculum with which they come into contact becomes covered, with resultant failure of elimination of aqueous *at that point.* The current of the aqueous is thus diverted to other parts of the angle which in turn become covered by the exfoliated material. Thus it can be seen that eventually there will develop a complete blockage of the entire periphery of the chamber angle.

How much of the periphery of the chamber angle must remain open to maintain a normal balance of intraocular

pressure is not known. Based entirely upon clinical experience with iridectomy in acute incompensated glaucoma, we believe that if 35 degrees to 45 degrees of the entire 360-degree periphery is open, there will not be a pathological rise in pressure. But certain it is that as the chamber angle is gradually blocked, an additional load is thrown upon the iris that, glaucoma capsulare ceases to be a primary condition and becomes definitely a form of secondary glaucoma.

Histopathologic studies

Busacca in 1927 made the first histologic examination of eyes with capsular changes. His interpretation and the refu-

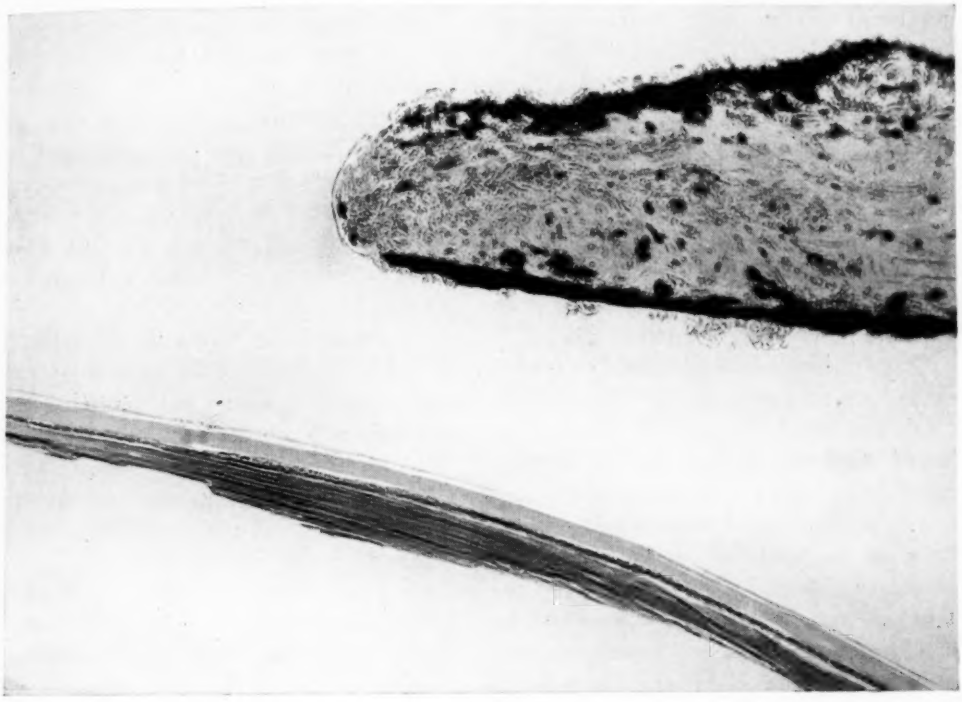

Fig. 7 (Gradle and Sugar). Exfoliation of lens capsule with deposit on both surfaces of the iris. (Case N. G. Microphotograph of slide donated by Dr. T. L. Terry.)

absorption mechanism until that, too, becomes overloaded and is no longer able to maintain a normal pressure balance. Where that point occurs can be told only clinically.

The clinical and etiological recognition of glaucoma capsulare makes some reclassification necessary. The essential difference between primary and secondary glaucoma lies in the fact that the cause of the hypertension is known in the latter class, but not in the former. In view of tation of his views by Grzedzielski have been discussed.

Vogt[67] in 1928 examined a globe with clinically observed capsular exfoliation. In 1932 he described three types of histologic change in the capsule: (1) laminalike loosening of the superficial lamellae; (2) exfoliation with focal thickening of the capsule, and (3) flakelike dissociation of the lamellae of the capsule. He found vacuoles both superficially and deep in the capsule and stated that the

vacuoles were the cause of the capsular opacity.

In 1929 Rehsteiner examined one globe and in many sections found fine striations in the capsule. He found exfoliation in the area from 1.1 to 1.6 mm. from the equator toward the axial portion, which was covered with exudate.

Bey in 1931 sectioned another globe and found small highly refractile masses similar to lens capsule in the furrows and grooves in the back surface of the iris. The edge of the pupil presented a band of dense or compressed structure showing fine lamellations. He stated that pellicles were scarce on Descemet's membrane. He found the chamber angle normal in width and the spaces blocked by pigment. A homogeneous mass extended from the pectinate ligament to an opposite point at the iris root.

Other histopathologic studies were made by Caramazza in 1934, Fahmy[68] in 1936, and Maghraby in 1937. Fahmy believed the zonular lamella to be pigmented. In 1938 Vogt[69] reported the first histologic findings of lens capsule precipitates on the posterior corneal surface in glaucoma capsulare. He also studied the post-mortem globe in a case in which he had previously seen the lamella project into the anterior chamber. He believed that the oval vacuoles present in the lamella pave the way for capsular destruction.

In 1939 Wiederkehr,[70] from Vogt's clinic, described the findings in 18 eyes of 14 patients between the ages of 60 and 104 years. He stated that exfoliation involves only the anterior capsule and predominantly the thick part toward the anterior pole.

The accompanying photomicrographs are self-explanatory and need no discussion except to point out the characteristic serration of the posterior iris surface that occurs with capsular exfoliation. They are from as yet unpublished reports of cases studied by Dr. T. L. Terry of the Massachusetts Eye and Ear Infirmary and were donated by him expressly for this article. We wish to take this opportunity of expressing our sincerest thanks for his courtesy.

Treatment

Medical treatment with miotics is the first indication in glaucoma capsulare. Many of these cases do not respond well, or only temporarily, to miotics, probably because of the nature of the obstruction of the trabecular spaces with capsular pellicles. Miotics are also indicated in cases of capsular exfoliation, thus preventing further obstruction at the chamber angle. Linn[71] recently suggested the use of miotics or mydriatics to immobilize the iris.

Because of the frequency of cataract in cases of capsular exfoliation and glaucoma capsulare, many cases require lens extractions. Such cataract cases in which the tension is uncontrolled require antiglaucomatous surgery first, as do uncontrolled cases of glaucoma capsulare in which the lenses are clear.

Of 43 eyes that have been operated on, in the authors' series, 18 had lens extractions, 13 by the extracapsular method, 1 by the loop, and 4 by the intracapsular method. Vitreous was lost in three of the latter. Two required cyclodialysis for recurring ocular hypertension. Because of the finding of fluid vitreous in every advanced case in which the vitreous was visible, it is suggested that the lens extraction be by the extracapsular method. The most frequently employed operation in this series was the Elliot trephining performed in 16 cases. Cyclodialysis and iris-inclusion operations were each performed seven times.

Conclusions

From the evidence gathered from the

literature, and that presented here, capsular exfoliation is probably a senile degenerative disease, involving the vitreous body and its derivatives, the zonule fibers, and the zonular lamella.

For some reason, possibly the trauma of the contiguous moving iris, the portion of the anterior capsule in contact with the posterior iris surface develops small vacuoles that tend to separate the lamella into fine laminae. The equatorial zone also shows this process to a lesser degree, possibly due to accommodative stresses. In the area traversed by the pupillary border, the thin laminae are exfoliated as a fine débris that is deposited on the pupillary border, the posterior iris surface, the ciliary processes, the cornea, and the trabeculum. In the last-named location it tends to obstruct the channels for the outflow of the intraocular fluid, and a secondary type of glaucoma—called glaucoma capsulare—results. In the authors' series it was present in 72 percent of cases. If started early in the course of this condition, the use of miotics to arrest the process may prevent the development of glaucoma. When glaucoma has already developed, antiglaucomatous surgery is indicated. When lens opacities require surgery, the extracapsular operation is recommended. Patients with capsular exfoliation should be made to understand that they may develop glaucoma and should be watched at intervals.

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RETINAL CHANGES WITH MARKED IMPAIRMENT OF VISION IN MEASLES

Report of a case

F. R. Shlossberg, M.D., and Morris Prizer, M.D.
Haverhill, Massachusetts

It is a prevalent conception among both the laity and medical profession that measles is not an infrequent cause of blindness or of marked visual impairment. Yet Berens, Kirby, and McKay,[1] in their report of a study of 2,702 cases of blindness, find that only .9 percent are due to measles. Records of 3,836 cases at the South Department, Boston City Hospital, over a period of 20 years, do not show a single case of blindness following measles. The cases reported in the literature deal almost exclusively with extraocular complications.[2, 3, 4] C. H. Helfrick[5] reports a post-mortem examination on a case of measles with blindness revealing a lesion in the visual centers of the occipital lobe.

Patient J. S., female, aged six years, entered the South Department at the Boston City Hospital on April 7, 1939, with the following history: A rash on the body was first noticed on April 2, 1939, and a diagnosis of measles was made by the family physician the following day. The course of the measles was uneventful and mild. Catarrhal symptoms were mild. On the day prior to admission, the child complained of failing vision, and on the following day vision was nil.

Physical examination on entrance: The patient was a well-developed, well-nourished child, appearing bright and active, except for blindness. In addition to the ocular pathology the only other positive finding was the skin, which showed a fading maculopapular eruption consistent with a late measles rash.

Laboratory findings: The blood picture was negative except for a relative lymphocytosis; the Hinton, negative; bleeding and clotting time normal. The urine was normal except for a few white cells. An X-ray study of the sinuses showed the right frontal small, the left frontal absent. There was no evidence of infection. Lumbar puncture on April 8, 1939, gave the following results: Cell count, 23; polymorphonuclears, 5 percent, lymphocytes, 95 percent. Total protein, 26; sugar, 50; chlorides, 732. The blood pressure was normal; the Wassermann test negative.

On April 14, 1939, the cell count was 3 (lymphocytes). The total protein, 19; sugar, 38; chlorides, 716; Wassermann, negative.

A tuberculin test was negative.

The temperature, pulse, respiration, and blood pressure were normal during the child's stay in the hospital.

Eye examination from the date of entrance to date of discharge:

April 8th

Conjunctivae were normal; the corneae clear; the anterior chambers, irides, lenses, and vitreous were normal. The pupils were widely dilated, equal, and reacted sluggishly to light.

Fundus: The disc was somewhat hyperemic, its outline blurred, particularly along the nasal margin, with about two diopters of swelling present. The veins were moderately engorged, the arteries small, threadlike, with no evidence of thickening of the walls. There was no nicking at the arteriovenous crossings. Distributed throughout the fundus were numerous small, round hemorrhages. Other parts of the retinae were pale and edematous.

Vision: No light perception nor projection in either eye.

April 10th (3d day)

The disc was less hyperemic, and the outline blurred. Papilledema or swelling was still present. The hemorrhages were seen to be absorbing. Vision as before.

April 12th (5th day)

The pupils were two thirds dilated; there was no reaction to light. The anterior chambers and media were clear. The optic-nerve heads were edematous and waxy. In both maculae there was absorbing of hemorrhages. Vision still nil in both eyes.

April 13th (6th day)

Reaction to light was present, but very sluggish. Dustlike vitreous opacities were present. The discs showed beginning secondary optic atrophy; degenerative retinae were now seen and hemorrhages absorbed.

April 16th (9th day)

Better pupillary function was evident and the pupils were of normal size. The picture was unchanged except for a round, circumscribed, small lesion in the left macula. The left eye had peripheral light perception.

April 19th (12th day)

Vision as before. The discs were gray and edematous. There was improved reaction to light.

April 20th (13th day)

The pupils reacted more promptly and completely. Numerous punctate exudates were seen throughout the retina and in the macular areas, where they tended to become confluent.

April 24th (17th day)

The fundus of the right eye showed a large area of degeneration of about a disc diameter involving the macula. The retina now assumed an orange color and the nerve head was well defined and white. The left fundus showed a well-circumscribed area of degeneration, appearing like a hole, in the macula, with heaped-up pigment at margins.

May 4th (27th day)

The vision in both eyes was the ability to detect hand movements at a distance of two feet. More pigmentary hyperplasia was seen in the retinae of both eyes.

October 7th (return visit)

The pupillary reactions were quite normal. They were equal and full, although not prompt. Ophthalmoscopic examination showed normal lenses; the vitreous clear; the discs pale. This pallor was not of the pure-white color, but of a grayish, waxy appearance, and the disc edges were not clearly defined, suggesting the type of atrophy which is termed secondary optic atrophy. The arteries and veins were very small throughout their whole length in both fundi. The right macula had a few fairly large and many small white spots suggestive of previous exudates. The left macula showed a similar picture but not as marked. Throughout both fundi there was a fine granular appearance of both retinae. Intraocular tension was normal. The vision in the right eye was 4/200, and in the left 3/200.

The patient was seen by several outstanding ophthalmologists who differed in their diagnoses, but all agreed that the case was an unusual one and related to measles. The diagnoses advanced were as follows:

1. Acute neuroretinitis.
2. Venous thrombosis with secondary changes due to altered blood supply.
3. Neurochorioretinitis.
4. Embolism of the central retinal artery. (The ophthalmologist who made this diagnosis saw the patient one month after onset of the disease.)

This case of almost complete blindness complicating a relatively mild attack of measles is presented because of its rarity.

116 Emerson Street.

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AN INHERITED EYE DEFECT IN THE GUINEA PIG*

Report of further anatomic studies

Harry Lewis Foust

Ames, Iowa

Introduction

The work reported here represents further studies on an inheritable defect appearing in the cornea of the eye of certain guinea pigs (Cavia cobaya). Whitlock's (1935) paper discussed the changes in the defective eye as it was found in the guinea pigs after birth. This paper covers the changes in the defective eyes as they were seen in embryos and adds data to those given by Whitlock. Lambert and Shrigley (1933) gave a description of the condition, which behaved, in general, as a single Mendelian recessive. In this paper literature is reviewed as it was found to relate to the problem. Considerable reference to the embryology, structure, and physiology of the normal eye has been brought together to serve as a background for the interpretation of the observations.

Materials and methods

Normal eyes from both embryos and from animals whose ages ranged from a few hours postpartum to adult were obtained from various and apparently unrelated sources. The defective eyes were taken from a strain developed in the guinea-pig colony of the Department of Genetics, Iowa State College.

The whole mounts of corneas were taken from animals which had received intra-arterial injections of a carmine-gelatin mass. These were fixed *in situ* in 10-percent solutions of commercial formalin, removed, cleared, and mounted (Whitlock, 1935). Although early in the preparation of the material used in this study a celloidin-embedding technique was used by Whitlock, the major portion of the tissues was prepared for study by using standard formalin, paraffin, and hematoxylin and eosin techniques.

Review of literature

Embryology of the cornea. The necessity for the apposition with the surface ectoderm of the deeper special structures of the eye in the development of the cornea has been emphasized and determined experimentally by Mangold (1931), Hagedoorn (1937), Hertwig (1899), Lewis (1905), and Fessler (1920). Lindahl (1915) found in many mammals that the anterior chamber became distinct near the end of development. The cornea would then have been partially separated from underlying struc-

* From the Department of Veterinary Anatomy, Iowa State College.

tures. In the 18-day guinea-pig embryo Harman and Prickett (1932) reported that the lens vesicle was separating from the outside ectoderm. This process must precede corneal formation. Mann (1928) has given a description of corneal development in the human eye.

Popoff (1934) in the tadpole found an interspace in the cornea, the development of the parts superficial to it being under the influence of the anterior epithelium. In observing figure 207 of Mann's (1928) "Development of the human eye" an interspace may be seen between the structures marked "a" and "b." Possibly this interspace is similar to the one described above by Popoff.

The development of the substantia propria has been explained in various ways. A gelatinous layer deeply to the ectodermal epithelium was described by Hensen (1866) as being used in the formation of the cornea. It at no time was said to resemble the sclera or choroid. Laguesse (1923, 1926) has discussed in considerable detail a similar structure which was said to be somewhat lamellated and was termed "mesostroma." This was said to be of ectodermic origin and later was invaded by mesodermal cells which governed the development of the collagenous fibers of the tunica propria. Studnicka (1913) has given in his treatise "Das extracellular Protoplasma" considerable discussion on the properties of "mesostroma." Knape (1909) has described an early loose fibrous membrane between ectoderm and lens vesicle, the "Richtungshäutchen der Cornea," in which meridional fibers later developed and into which mesenchymal cells migrated. Hagedoorn (1937) concurred with Laguesse, *vide supra,* in that mesodermal differentiation was preceded by the presence of ectodermal tissue, and in man he described a "definitive ectodermal cornea" between the anterior epithelium and Descemet's endothelium. This proved to be also true for other species as reference to figure 3 of his paper (Hagedoorn, 1937) will show. Mann (1928), too, found ectodermal fibrils in early stages in the development of the human cornea. Wolfrum (1903) described processes of some of the basal cells of the anterior epithelium which extended into the deeper fibrillar substance but was unable to observe direct connections with the latter. C. Rabl (1900) has described differentiation of mesodermal cells between the lens epithelium and the ectoderm as the first anlage of the substantia propria of the cornea, and Grosser (1934) observed a migration of mesodermal cells between separated layers of the ectodermal stratified epithelium to form the proper substance of the cornea. The changes occurring in the formation of the substantia propria corneae were studied in a series of cattle embryos from 6 mm. to 25-30 mm. by Ayres (1879). Hertwig (1899) has stated that at a very early stage in the development of the embryo, the epidermis was separated by a thin layer of mesenchyme from the lens. Into this mesenchyme, cells migrated from its periphery. This layer later is divided by the anterior chamber into the basis of the cornea and of the pupillary membrane. Folds of skin he described as growing on the eyeball. The epidermal edges of these fused, thus closing the lacrimal sac, but near the termination of gestation, these folds, eyelids, were again open.

The posterior epithelium of the cornea, Descemet's endothelium, was described by Mann (1928) as arising by a rearrangement of the cells *in situ* and as not growing from the periphery. The presence of a normal eye in a normal place was said by Fischel (1919a) to be necessary for maintaining the proper functioning and morphological properties of the cornea. Speciale-Cirincione (1917) has

stated that early (2 months) in the development of the human embryo cuboidal elements separate the ectodermal epithelium and the lens. These, which he called "endothelial lamina," were said to be the first sign of the deep covering of the cornea. A triangular thickening of this lamina he termed "endothelial circle," and stated that it would separate ciliary body and iris. In this circle lacunae were later formed, the lining cells having come from the cells of the circle, as if the cells of the circle had been separated by the penetration of liquid.

Structure of the cornea. The structure of the cornea has been discussed in most textbooks of histology. Furthermore, most textbooks of ophthalmology devote some space to the anatomy of the cornea.

Anterior epithelium of the cornea. There is quite general agreement in regard to the number of cell layers in the anterior epithelium—6 or 7 to 10, regardless of the species of animal. Rubert (1914) found that in the guinea pig the corneal epithelium had five or six layers. The cells of the deepest layer were cylindrical and were wider than those at the limbus. The next two layers were composed of spheroidal cells and the surface two or three layers were made up of flat plates. Near the limbus the surface cells were found to become cylindrical. Whitlock (1935) reported a similar number of layers in the anterior epithelium of the corneas of the guinea pigs used in this work. Those texts which refer to keratinization of the surface cells say it does not occur normally.

Stricker (1873) has reported that Krause had observed peculiar ellipsoidal cells among the epithelial cells. Shaffer (1922) described "club-shaped" cells among the basal cells with the narrow portions basally and the clublike ends extending above the basal cells.

The anterior elastic membrane of the cornea. The presence of an anterior elastic membrane in the various animal species is disputed. Leydig (1857) stated that both posterior and anterior homogeneous membranes were present in the guinea pig. Nicolas (1924) described the membrane as being present in the domestic animals and stated that it received the basal ends of the "prismatic cells." Ellenberger (1906) and Lightbody (1867) both have stated that it was absent in animals other than man. Ellenberger excepted birds in which a homogeneous layer was said to be present. Lightbody explained its presence as an "optical illusion" produced by the reflection from the apposition of two structures each having different densities and refracting powers. Rubert (1914) did not find any pronounced Bowman's membrane in the guinea-pig eye. Whitlock (1935) found it absent in the guinea pig, but its place was said to be taken by a "thin, basement membrane."

Proper substance of the cornea. The literature reviewed was in quite close agreement concerning the structure of the substantia propria corneae as given by textbooks on histology.

Posterior homogeneous membrane of the cornea. Lightbody (1867) found the membrane of Descemet to have a thickness of 0.00025 inch. Fritz (1906) gave the following measurements for the thickness of the lamina limitans interna in the guinea pig: aged, —6 μ; young, —2 μ; newborn, —1 μ; and six-weeks embryo, —0 μ.

Posterior endothelium of the cornea. The posterior endothelium, endothelium camerae anterioris, has a structure upon which the literature differs but little. Fritz (1906) found it to be of an extraordinary height in the guinea pig.

Blood and lymph supply of the cornea.

Much has been written in regard to the blood and lymph supply of the cornea. There is a general agreement on the absence of vessels from the substantia propria. However, in Leydig's (1857) text, reference is made to fine vascular loops which extended into the cornea a short distance. Lightbody (1867) described vascular loops which passed into the cornea to a distance equal to one fifth of its radius. In Strickner's (1873) manual, Rollett and Leber, referring to J. Muller, have reported vessels on the anterior surface of the cornea. Fritz (1906) found a peculiarity in the guinea-pig eye in that under the ligamentum pectinatum two arteries arose in the iris which, with branches of the arteria ciliaris posterior, formed a circle. Lodemann (1917) observed that vessels were never normally present in the cornea; however, he did say that in the stroma of the limbus there was a superficial capillary network which belonged to the episcleral vessels. The cornea was claimed by Graves (1936) to be, at no stage of its normal development, a vascular structure. Frey (1875), of the same general opinion, described, however, a narrow row of vessels at the limbus which, he said, were the last trace of a vascular covering of the "anterior surface of the cornea of an earlier existence." In lower mammals he (Frey, 1875) stated that this row of capillaries was broader and was joined by "deeper, finer capillaries" from the scleral vessels. Ruedemann (1933) described some fine capillaries of the limbus as going into the cornea for a distance of a few millimeters in the human eye. In the strain of guinea pigs used in the studies reported in this paper, Whitlock (1935) found that, normally, "tiny capillary loops" extended into the cornea for a short distance, but quite evenly, from the corneoscleral junction.

Considerable difference of opinion has existed and continues to exist in regard to the vascular drainage away from the cornea and anterior chamber. Much of the divergence of ideas is related to the presence of a canal of Schlemm and to its function in the vascular drainage system of the eye. Lightbody (1867) described a circular venous sinus of Schlemm as extending around the limbus and some distance from it, and at the junction of the superficial and middle thirds of the substance of the sclera. Stricker (1873) discussed the part the canal of Schlemm may play in the preservation of intraocular pressure. Stricker also reported Schwalbe as having demonstrated by injection methods the communication of the anterior chamber through Fontana's canal with Schlemm's canal. In discussing the comparative anatomy of the ciliary system, Duke-Elder (1934) pointed out that there were important variations from the canal of Schlemm as found in man. He referred to a "large anterior ciliary anastomosis" which was found in most mammals, among which were included ox, sheep, dog, pig, and rabbit, "deeply to the corneoscleral margin." In the eye of the rabbit Friedenwald (1936) was able to fill Schlemm's canal by the injection of a mass into the carotid arteries. He noted three types of connections—efferent venules, afferent venules, and "so-called" inner canals. The inner canals were described as blind pockets which extended from Schlemm's canal into the contiguous spaces between the trabeculae of the pectinate ligament. These canals were closed; that is, they did not communicate with the anterior chamber. Swindle (1937) doubted if a canal of Schlemm was present either in the fetal or adult animal. So also Troncoso and Castroviejo (1936) have stated that a

Schlemm's canal, "properly speaking," does not exist in lower mammals. They, however, described a "cilio-sclero sinus" in rodents, having used the rabbit for their studies. This sinus located between the sclera and the root of the iris appeared to have the same functions as those ascribed to the canal of Schlemm. Maggiore (1917) found certain rodents (rabbit) to be void of a canal of Schlemm. In the same article he described the removal of the aqueous humor largely to be a function of the ciliary vessels in animals in which the canal of Schlemm was poorly developed, yet when present the canal was the most direct efferent; and in conclusion he stated that the canal of Schlemm was a definite structure in itself, lymphatic in nature and annexed to the peripheral blood circulatory system In the guinea-pig eye according to Whitlock (1935) "it is difficult, if not impossible, to demonstrate a canal of Schlemm."

Lymphatic spaces were found by Lightbody (1867) about corneal capillaries. Hill (1915) and Nicolas (1924) both have described complex lymphatic networks in the proper substance of the cornea. Jossifow (1932) was unable to inject superficial and deep noncommunicating spaces in the cornea. Mann (1932) believed that lymphatic spaces said to have been found in the cornea were artifacts. Jordan (1930) and Ellenberger (1906) both have stated that lymphatics do exist in the cornea, while according to Duke-Elder (1934) there were no "true endothelial-lined" lymph spaces in the cornea.

Reticulo-endothelial cells were found to be present in the conjunctiva, sclera, and uvea and absent from the retina, vitreous, and lens, according to Gasteiger (1934), who made intravenous injections and subepithelial injections of trypan blue and of lithocarmine into the cornea to facilitate their detection.

Nerve supply of the cornea. There seems to be quite general agreement in the literature reviewed that the nerves to the cornea arise from the ciliary nerves, form a plexus in the substantia propria, and terminate by branches from this plexus to the anterior epithelium, to the substantia propria, and to the deeper layers of the cornea. Duke-Elder (1934) has given a comprehensive discussion of the morphology of the ciliary ganglion. The sympathetic nervous system was shown by Asher (1937) to provide the trophic nerve supply to the cornea. Sensitivity was found by Marx (1921) to increase from the periphery to the center of the cornea. All corneas, according to this worker, dry more or less after a time, and he found that decreased sensitivity which followed irritation may be followed by more rapid drying. This was thought to indicate the presence of trophic nerves.

Pigmented cells. The chemistry of melanin has not been completely determined. Melanin has been said to be insoluble in most solvents; for example, water, alcohol, ether, acids, alkalis (except warm potash and decomposition by concentrated nitric acid after considerable lapse of time—Frey, 1875; Szymonowicz, 1924; Sabotta-Piersol, 1930. It may be bleached by hydrogen peroxide and nascent chlorine (Sabotta-Piersol, 1930) and by sulphuric acid (Szymonowicz, 1924). Knowledge concerning the origin of melanin is shrouded in much uncertainty. Frey (1875) stated that it was of hematogenous origin because in many pathological black pigments their origin could be "accurately traced" to hematin. Szymonowicz (1924) has referred to its intracellular origin from the nucleus as supported by other workers. Von Szily (1911) and Hooker (1915), too, have

supported the role the nucleus may play in its elaboration. Goldberg (1919) stated that it appeared to be a metabolic product of protein. The removal by the epithelium of soluble pigment from the blood was described by Scherl (1893) as a function of the epithelium. The fluid pigment was said to be transformed into spherical droplets and later into crystals varying in shape in the various animals. Redslob (1922) believed the presence of blood vessels was necessary for the elaboration of pigment. He gave, as examples, the presence of vessels at the limbus corneae, and in pathological conditions. Its origin has been discussed in detail by Duke-Elder (1934). He referred to the work of Bloch and to the possible formation of melanin as an end-product to the oxidation of certain groupings of the protein molecule (tyrosine, phenylalinine, tryptophane, and others). Duke-Elder (1934) also saw a close relationship of melanin to adrenalin in that those two substances may originate from the same precursor.

The cells which contain melanin have been variously described. Pigmentation of the feather was thought by Lloyd-Jones (1915) to occur without the intervention of specialized cells. Pigment may be intercellular in epithelium according to Schaffer (1922). Fol (1896) thought that pigment cells might migrate between epidermal cells. Renaut (1897) considered chromoblasts to be of lymphatic-cell origin. Pigmented cells were described by Laidlaw (1932) as being round, cuboidal, columnar, and dendritic in the epidermis. In the barbular cells of birds' feathers Champy (1935) has described pigmentation as beginning around the centrosome. He questioned whether cellular pigmented rami furnished all the pigment to the epithelial cells or only stimulated a pigmentogenesis in them. The pigmentary cells of the barbs were found by him to transfer pigment to the medulla of the feather. A similar observation had been made at a much earlier date by H. Rabl (1894).

The ectodermal origin of melanophores has been supported by Strong (1902, 1915, 1917), Percival and Stewart (1930), Peck (1931), Ramon-Cajal (1933), Du Shane (1938), and Pillat (1933a) who described the melanoblast as a dendritic cell which did not change its shape nor function and which might be found in the hyperpigmented conjunctiva at most levels of its epithelium. The dendrites were described as of two kinds—(1) a short type, which belonged to pigment cells among the basal cells, whose processes were parallel to the surface of the epithelium; and (2) a long type, whose processes projected through the intercellular spaces to the superficial layers. By experimental growth, *in vitro,* of neural-crest tissue and by transplantation of neural-crest tissue to suitable hosts was Dorris (1938, 1939) led to conclude that cells from that source were *sui generis* able to differentiate into pigment cells, and that "pigmentation of black fowls is the result of the presence of melanophores of neural-crest origin, which finally become distributed throughout the dermis and feathers."

Dahlgren and Kepner (1908), in referring to the work of Ehrmann, described melanophores as being of mesoblastic origin, and from the melanophores in the lymph spaces of the epidermis, melanin was said to be absorbed by epidermal cells.

Two types of pigment cells were described by Eycleshymer (1906) in Necturus—a slightly branched cell in the epidermis of unknown origin, and a branched mossy type of mesodermal origin. Fischel (1919b) has said that melanophores, both epidermal and con-

nective-tissue types, originated in their respective tissues. Post (1894) gave a similar explanation, but he believed that the branched cells of epidermal origin may displace the connective-tissue pigment cells.

Apparently pigmentation in varying degrees of the normal cornea occurs quite generally (Ellenberger, 1906). In the text of Bulliard and Champy (1929) one reads that the cells of the anterior epithelium of the cornea may contain some grains of pigment. Melanophores have been reported as being found in the anterior epithelium of the corneas of many animals (Lightbody, 1867; Fischer, 1905; Lodemann, 1917; Fischel, 1916b; Duke-Elder, 1934; Ovio, 1927). According to Duke-Elder (1934) and Lightbody (1867), pigmentation may be more marked at the limbus, Lightbody having observed it passing for some distance into the cornea. Ovio (1927) included the guinea pig among those animals having pigmented cells in the anterior epithelium of the cornea. Pigmentation was described by Rubert (1914) as being regularly found in the basal cells of the limbus conjunctivae of the guinea pig. Ordinarily the more superficial cells were pigmented also. The pigment appeared in cap-form distal to the nucleus. The pigment was in small spherical lumps more superficially. The pigment cells were described as being of various shapes and often branched. Rubert also found pigment in the subepithelial connective tissue of the cornea. Here, it was interfibrillar; connections between the interfibrillar pigment cells and those of the epithelium could not be ascertained. This writer stated that the corneal pigment resulted from migration of the circumcorneal pigment cells. A dark-brown pigmentation was observed by Rubert in the corneas of 3.3 percent of a large number of guinea pigs. Whitlock (1935) described a similar pigmentation in the guinea-pig eye. He stated that:

> Just inside of the margin of the cornea there begins a deeply pigmented area, which is continued out into the scleral conjunctiva. The area of pigmentation is very regular and distinct and can be easily traced both in whole mounts and sections (figs. 1 to 5). This pigmentation is due to the presence of numerous stellate, pigmented cells in the columnar cell layer of the conjunctiva.

Abnormal pigmentation may occur either congenitally or as a response to certain types of stimulation. Experimentally, in regeneration of the eye, Comberg (1934) found that in the corneal epithelium there was an attraction by the border of a wounded area for pigment. Peters (1919) found, in congenital pigmentation of the cornea, pigmentation not only of the corneal epithelium but also of the substantia propria. Augstein (1912) observed pigmentation in melanosis corneae to be most marked in the region of the limbus and stated that the cells producing the corneal pigmentation had migrated from the iris. The observation that pigmentation was more marked in the limbus in melanosis corneae had been previously noted by Yamaguchi (1904), who further found that the pigment was localized in the basal layers of the epithelium of the cornea and that the processes of the chromatophores extended superficially. Under pathological conditions a normal conjunctiva may, according to Pillat (1933a), respond to irritants by the altering of the protoplasm of the epithelial cells so that "cap" pigment is formed. An extension of a mass of pigmented cells from the subepithelial tissue into the epithelium was described by Pillat (1933b). An epithelial and an endothelial form of melanosis corneae has been described by Fuchs, Salzmann, and Brown (1908), the epithelial type extending from the limbus, which, they stated, was not infrequently pigmented.

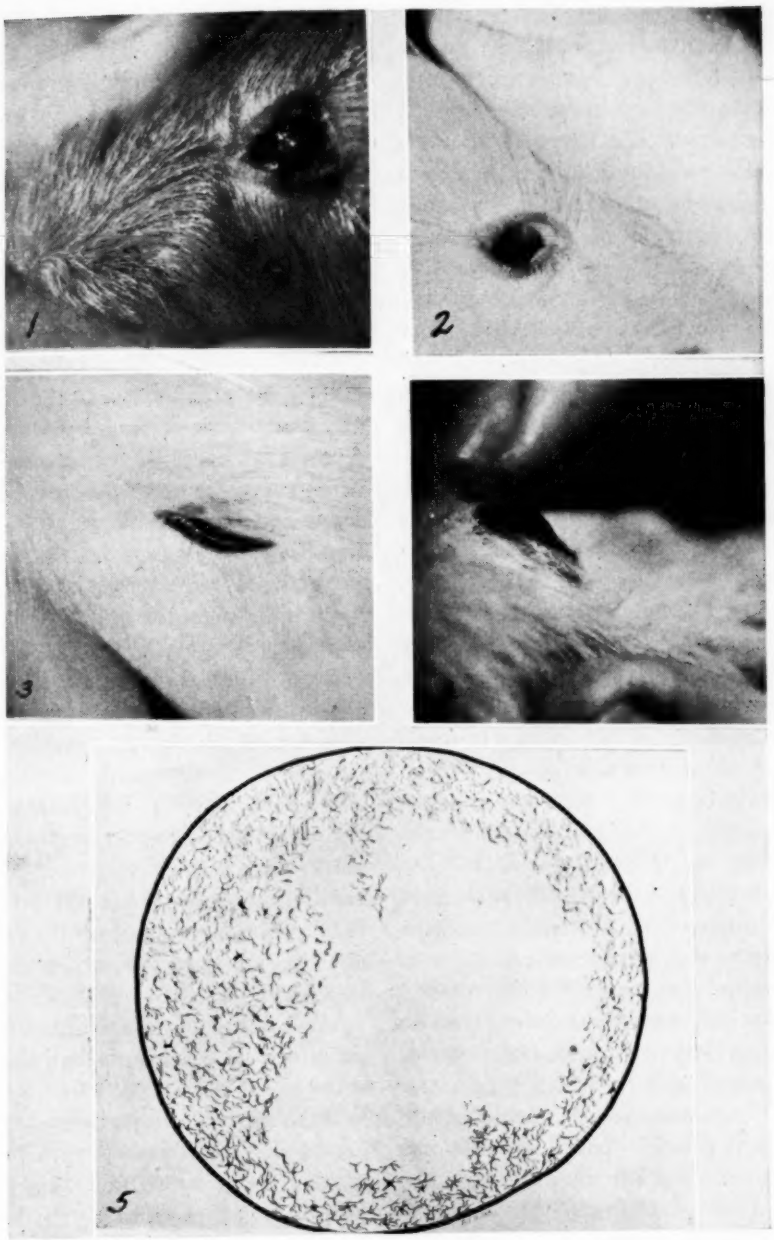

Plate 1 (Foust).

Figs. 1 and 2. Affected eyes of guinea pigs. Lateral view to show character of cornea. Palpebrae held open.

Fig. 3. Affected eye of guinea pig showing marked enophthalmos.

Fig. 4. Affected eye of guinea pig, dorsal view, showing irregularity of vertex of cornea. The palpebrae were forcibly retracted.

Fig. 5. Drawing to show distribution of melanophores in the cornea of an affected eye of an adult guinea pig.

It was the opinion of Pillat (1933b) that in some disturbances of the deeper cell layers of the conjunctiva, such as in vitamin-A deficiency, as he observed its symptoms among the Chinese, the epithelial cells, in addition to their function of increasing in number and migrating superficially as replacement cells, may be protected by a network of dendrites of melanoblasts. These cells may be further protected by "cap" pigmentation. The process was discussed by Pillat (1933a) in considerable detail. He has further discussed two kinds of pigmentation in the conjunctiva: a physiologic type in which the dendrites of the melanoblasts have their long axes parallel to the surface of the epithelium and the pigmentation of the cells may be less, and a pathologic type in which the dendrites of the melanoblasts are perpendicular to the surface of the epithelium and the pigment may be much more pronounced in the cells.

Vascularization of the cornea. Superficial and deep vascularization of the cornea has been described by Graves (1936), by Fuchs, Salzmann, and Brown (1933), and by Duke-Elder (1938). In the superficial type the vessels were said to be continuous through the limbus with the adjacent conjunctival vessels, while in the deep type the newly formed vessels arise from the deep ciliary vessels. The superficial vessels were said to branch "arborescently" and to form networks of irregularly anastomosing branches, while the deeper vessels tended to run in straight lines and branch in a bifid fashion. Both Lightbody (1867) and Stricker (1873) found that capillaries may be formed in the cornea following irritation. Vascularization of the corneas was found by Long, Holley, and Vorwald (1933) to be well developed in one month in guinea pigs which had experimental tuberculosis of the corneas. From intravascular injections of pig, rabbit, sheep, and human embryos, Hirsch (1906) concluded that vascularization of the cornea was confined to its periphery, and only in pathological conditions was vascularization to be found in the central part of the cornea. Steiner (1923) found one case of corneal epithelial pigmentation accompanied by vascularization and one without vascularization. In the fetal eye Wintersteiner (1909) reported in a case of uterine gonorrhea the presence of an epithelial cone in a cornea in the middle of a vascularized area. Some very interesting work has been done on the vascular changes in the cornea resulting from sensitization experiments. Julianelle and Lamb (1934) found, in the hypersensitive cornea of the rabbit, that in the milder reactions the capillaries developed superficially and were small, while in corneas which showed a more marked reaction, additional and more deeply situated capillaries were formed and were increased in number at the borders. Julianelle and Bishop (1936) believed that the formation of vessels in the sensitized cornea indicated "a secondary change depending upon the degree of inflammation induced by the injection of the antigen into the sensitized cornea." Histologically, they said that "the corneal vessels are seen as branches of the adjoining conjunctival vessels" and that they extend between the corneal lamellae. They found that the vascular response may apparently be speeded up after repeated inoculations so that new vessels may appear in the course of six to eight hours. Certain infections of corneas by various bacteria were found by Julianelle, Morris, and Harrison (1933) to result, in a period of a few days, in the vascularization of areas immediately adjacent to the point of irritation by a few vessels which were largely branches of a single vessel and which

formed a meshwork that surrounded the irritated area and gave a picture termed "salmon patch." Even though, after a long series of inoculations, the inoculations be discontinued, they found that the vessels never disappeared.

Abnormal corneas. Various abnormalities, which would include such a disturbance as has been considered in this study, have been described in textbooks on ophthalmology and on diseases of the eye. Ulcer of the cornea has been described in much detail. Xerosis too has been given some attention. A survey has been made of some literature considered to be of especial interest. Peters (1919) found in congenital pigmentation of the cornea that the epithelium may be irregularly thickened and defective in some areas. Scaling of the corneal epithelium may occur in animals with general disease in which case the eyes may have been kept open for a long time, according to Moller (1910), and there may be, further, a sloughing of the substance of the cornea. Except in infantile ulceration with conjunctival xerosis, ulceration of the cornea in the young of the human family, according to Werner (1915), is rare. It was said to occur more commonly in old individuals. A dominant type of inheritable disposition to recurrent erosion of the cornea was found by Franceschetti (1928) to occur in children. The disturbance was said to be instituted by trauma and rarely occurred in the later span of life.

Pillat (1930) and Mouriquand, Rollet, and Chaix (1931) have described dullness and edema of the cornea with desquamation of epithelial cells and subsequent inflammation in prexerosis corneae associated with vitamin-A deficiency in the human.

The relationship of lacrimal-gland activity to xerosis of the cornea has been discussed by Fuchs, Salzmann, and Brown (1933), and by Parsons (1934). Xerosis was said not to follow removal of the lacrimal gland. The dryness was explained by the failure of the tears to cling to the conjunctiva. In advanced xerosis tear secretion was described as lessened.

Epithelial defects may appear in the cornea consequent to cervical sympathectomy and exposure to the rays of a quartz lamp, according to Chervet (1936).

Mall (1908) in a study of human monsters emphasized the part that a damaged chorion may play in their production. He stated that "the changes in the chorion are primary, and those in the embryo secondary."

Fuchs, Salzmann, and Brown (1933) and Long, Holley, and Vorwald (1933) described the cellular response in infected corneas as beginning at the limbal vessels, and the cells were reported to wander from this point to the focus of irritation.

Physiology of the cornea. Lightbody (1867) ascribed to the membrane of Descemet the function of "preventing the too rapid absorption of the aqueous humor by the cornea." Adler (1933) has reported that the newborn fail to shed tears, thus the conjunctiva would not be protected by bactericidal enzymes. He, Adler, gave credit to Fischer for the observation that oxygen can diffuse through the cornea in one direction only, that is, from the superficial to the deeper parts, while carbon dioxide can pass only outward through the cornea into the air. Krause (1934), referring also to the work of Fischer, had the same ideas in regard to the unidirectional permeability. However, Krause called attention to the observation of Fischer that if either of the epithelial layers of the cornea were injured the cornea would become permeable to water in both directions. He said

that swelling of the proper substance of the cornea followed swelling of the epithelium. Further, in referring to Fischer, Krause explained that the unidirectional flow was an exclusive property of stratified membranes, that the flow of water is directed from the layer with the higher imbibitory power to that with the lower, but that if the degree of tumescence is away from the normal the permeability may become "reciprocal." The permeability of the corneal epithelium was said by Krause to be influenced by the trigeminal nerve. He supported this observation by referring to Tagawa's experiments showing that irritation and section of the trigeminal resulted in increased swelling of the epithelial cells and in their desquamation. According to Fischer (1929) solutions of sodium chloride and of acid dyes will pass through the cornea from the outside to the inside while basic dyes are inhibited. However, he found that such dyes which do not pass through the cornea and are in a finely divided state may, when injected intravenously, produce staining of the iris vessels. Sugita (1935) reported that colloidal substances will not pass through either Descemet's or Bowman's membranes, thus these membranes can prevent the penetration of colloidal substances into the corneal stroma, into the epithelial cells, or into the endothelial cells. Crystalloids in contrast were found to pass through all three.

Experimental results will appear in the next issue of the Journal.

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A NOTE ON THE TREATMENT OF THE SEQUELAE OF PERFORATED CORNEAL ULCER*

PETER C. KRONFELD, M.D.
Chicago

Although uncommon in private and institutional practice in the U.S.A., the perforated corneal ulcer and its sequelae are deemed to be subjects of sufficient interest to warrant the publication of several related experiences gained at the Peiping Union Medical College (or, in brief, the P.U.M.C.).

There is a great difference in the relative incidence of eye diseases between the material seen in the P.U.M.C. hospital and clinics and the material of, let us say, the Illinois Eye and Ear Infirmary in Chicago. With regard to the latter place it is not far from correct to say that one third of the time of the attending staff is taken up by refraction work, one third by work on cataract cases, and the remaining one third by work on cases of various kinds. In Peking an altogether different situation prevails. Taking, as an example, the intraocular operations performed at the P.U.M.C. one finds that 29 percent are for the relief of senile and other forms of cataract, 28 percent for the treatment of secondary and 15 percent for the treatment of primary glaucoma, whereas the remaining 28 percent represent optic iridectomies. In most of the operations for secondary glaucoma the latter is due to an anterior synechia which is the outcome of a perforated corneal ulcer. Since the optic iridectomies also concern themselves with the aftereffects of perforated corneal ulcers it may be said that two thirds of all intraocular operations are performed for the correction of sequelae of perforated corneal ulcers. A similar situation prevails in the field of conservative eye work, so that one may safely say that in Peking two thirds of the time of the eye staff is occupied by work on patients with perforated corneal ulcers; that is, (1) repair of recent prolapses of the iris, (2) repair of corneal fistulae, (3) optic iridectomies, (4) treatment of secondary glaucoma following anterior synechia, (5) plastic repair of, or enucleation for, staphylomata of the cornea. Casual observation of the Chinese people on the streets of Peking or in the country around Peking convinces one that adherent leukoma is very common among the population and that therefore its high incidence in the P.U.M.C., to some extent at least, reflects a general condition in the country. This high incidence of perforated corneal ulcers is, in my opinion, the most characteristic feature of eye work in North China. The fact of this high incidence appears still more remarkable if one realizes that the malignant forms of ulcerative keratitis are rare in North China. During five years in Peking I have seen only one typical case of serpiginous ulcer and only one case of pyocyaneus infection of the cornea. North China seems to be blessed by the absence of the very virulent microorganisms which cause malignant ulcers. The bulk of corneal damage is done by microörganisms which, in absolute terms, possess only very low virulence. The damage is, in my opinion, due to a special susceptibility of the Chinese to corneal infections which is probably the result of a low vitality of the cornea caused by chronic vitamin-A deficiency. The com-

* From the Department of Ophthalmology, The Peiping Union Medical College, Peking, China. Read before the Chicago Ophthalmological Society, October 16, 1939.

mon types of ulcerative keratitis seen in North China are manifestations of phlyctenular disease, of trachoma, of keratomalacia, or of various ectogenous infections, either typically catarrhal or appearing in atypical bizarre forms.

In cases of recent prolapse of the iris the size, location, and shape of the prolapse or rather of the corneal defect determines whether surgical or conservative treatment should be used. My experience has been that there is a direct relationship between the extent of the anterior synechiae developing during the healing of a perforated corneal ulcer and the incidence or the severity of secondary glaucoma. Therefore the principal aim of the surgical treatment must be prompt filling in of the corneal defect with as little permanent forward-displacement of the iris as possible.

The surgical procedure consists of excision of the prolapsed portion of the iris plus conjunctivoplasty. "The prolapsed piece of iris is to be excised in such a way that no adhesions between the edge of the perforation and the edge of the iris excision can take place," says Kuhnt in the Handbook of Ophthalmology of Graefe and Saemisch. My associates at the P.U.M.C. and I have found it advisable to do more than an excision of the prolapsed portion for the reason that the latter procedure may cause short iris stumps that are apt to form anterior synechiae.

Especially in prolapses with considerable expanse along and near the limbus our procedure has consisted of the excision of the entire iris sector corresponding to the prolapse. To do this, we have dialyzed the iris by carefully pulling on the prolapse and then excising the entire dialyzed sector. The technique of the iridodialysis is the same as that of the sclerecto-iridodialysis of C. N. Spratt.[1] The only anterior adhesions resulting from such a procedure are the usual peripheral synechiae of the pillars of the coloboma plus the amount of circular peripheral anterior synechiae which may develop during the period of absence of the chamber.

With regard to conjunctivoplasty, unusual difficulties are encountered in the Chinese, largely because a previous trachomatous infection has deprived the patient of his reserve of conjunctiva. Conjunctival flaps in the Chinese, therefore, have a strong tendency to retract, a tendency only partly overcome by counter-incisions in the case of apron flaps. If the prolapse is situated in the center of the cornea the flap has to be of the bridge type, in which case we usually cover the denuded area on the globe with a free mucous-membrane transplant from the lip. It has been our experience that the restoration of the anterior chamber after closure of the corneal wound with a bridge flap takes considerably longer than after closure of the wound with an apron flap. Absence of the chamber for a few days almost invariably leads to the peripheral anterior synechiae which, the gonioscope has shown us, develop after trephine operations in which the chamber is not promptly restored. For this reason the bridge flap is less desirable than the apron flap.

If, on account of the location, size, or duration of a prolapse, immediate surgical treatment seems contraindicated, the usual treatment is the application of silver nitrate or trichloracetic acid two to three times a week. Later on, surgical intervention becomes necessary for the prevention or the relief of secondary glaucoma and also to improve, if possible, the optical condition of the eye. It has been my experience that for the treatment of secondary glaucoma due to adherent leukoma the combination of cyclodialysis with a total iridectomy, both operations per-

formed in the same sector of the globe and in the same sitting, is most effective. How this operation, which has lately been brought into the limelight by Dr. John Wheeler,[2] lowers the intraocular pressure, I do not know. I have not been able to examine the chamber angle in the area of the operation under the gonioscope in these cases and therefore do not know whether or not the communication between the anterior chamber and the supraciliary space remains open. In these cases, my assistants in Peking preferred to make the incision for the iridectomy with the scalpel *ab externo,* so that there is a possibility of establishing filtration into the subconjunctival space. Since the iridectomy is performed partly for optical purposes the site of the operation is usually determined by the optical condition of the cornea. It is clear that, as stated by Wheeler, an iridectomy done immediately after a cyclodialysis in the same region is more likely to be total, that is, to include the root of the iris, than are other forms of iridectomy in which the ciliary body and the periphery of the iris were not separated from sclera and cornea immediately before the iridectomy. In other words, the combination of cyclodialysis and iridectomy would tend to make the iridectomy, as such, more effective. Besides, the removal of the iris from the sector in which the ciliary body was dialyzed makes secondary closure of the dialysis by a peripheral anterior synechia of the iris impossible.

In the course of a year, from 5 to 20 new cases of corneal fistula following perforated corneal ulcer are seen in the P.U.M.C. These fistulae result from prolapses of the pupillary border into perforated ulcers and are, therefore, usually situated near the center of the cornea. Obviously, attempts at closure of the fistula are indicated, since the danger of intraocular infection through such a fistula is very great. The standard surgical procedure according to the current textbooks on ophthalmic surgery is cauterization of the fistula plus conjunctivoplasty. This procedure alone has given satisfactory results—that is, closure of the fistula without rise in intraocular tension—in only a small percentage of our cases. In the large majority, the flap retracted before the fistula closed. In some of the successful cases I have made observations which have led me to believe that the fistula did not actually close and that fistulation continued into and under the conjunctival flap. In two cases the flap remained adherent to the cornea and the fistulation test consistently negative until, at the patient's request, the pedicle of the flap was severed near the limbus, which promptly made the fistulation test positive again. Besides, the entire flap in these successful cases usually remained succulent for several months instead of undergoing the involution and atrophy that is usually seen in conjunctival flaps which have become adherent to the cornea.

The chief reason, in my opinion, why many fistulae do not close upon cauterization plus conjunctivoplasty is the fact recorded by Fuchs in the early editions of his textbook; namely, that most of the eyes with corneal fistulae depend upon the fistula for the maintenance of normal intraocular pressure. All these eyes have gone through long periods of absent chamber and have therefore developed, in addition to the anterior synechiae of the pupillary border, a circular, peripheral, anterior adhesion. In other words, these eyes are in the same condition as eyes with primary glaucoma in which, following a trephining operation, the anterior chamber has remained absent for several days. The normal chamber angle has become closed by the adhesion of the entire root of the iris to the cornea and

the eye now depends upon the trephine bleb or, in the case of corneal fistulae, upon the corneal bleb for an outlet for intraocular fluid. In the latter case one must, therefore, expect a rise of tension as soon as closure of the fistula is accomplished. The surgical treatment of corneal fistulae, therefore, should consist of two parts: (a) the formation of a new outlet for intraocular fluid, and (b) the closure of the fistula. Part (a) was again most satisfactorily done by the combination of cyclodialysis with iridectomy. For China, where one does not like to depend upon large conjunctival flaps and, in the case of corneal fistulae, where those flaps would have to be made to cover the center of the cornea, I believe that the best surgical procedure for closure of a corneal fistula is excision and replacement of the fistula by corneal transplantation. The dissection of the fistula is not easy because of the intimate relationship between iris and leukoma, and the edges of the wound are therefore never so regular and smooth as they are in corneal transplantations without anterior synechiae. This may be the reason why in corneal-fistula cases the transplanted piece of cornea, which at the P.U.M.C. we usually take from the eyes of stillborn babies, usually became opaque. Corneal transplantations as a treatment for corneal fistulae were, as far as I know, first recommended by Fuchs and recently brought into the limelight again by Loehlein[3] and Vannas.[4]

Partial staphylomata of the cornea in eyes with some vision are fairly common in North China. The bearers of such eyes very often ask to have the appearance of the eyes improved and are only secondarily interested in maintaining what little vision there is left. Again our treatment first consisted of a cyclodialysis combined with iridectomy in a sector of the eye adjoining the staphyloma plus, in a second sitting, a partial excision of the staphyloma. The excised piece usually had the shape of a cross section through a biconvex lens. Corneal sutures on the order of the continuous suture which Castroviejo uses in corneal transplantation were inserted before the excision. In children in whom the amount of cooperation necessary for such a plastic operation could not be secured under local anesthesia, repeated multiple cauterizations of the wall of the staphyloma with a high frequency current were made. With such cauterizations considerable flattening of the staphyloma can be accomplished. The most common intraocular operation at the P.U.M.C. is the optic iridectomy. Most of the patients on whom these optic iridectomies were performed had adherent leucomata following perforated corneal ulcers, with a vision of less than the ability to count fingers at one meter. There was no perfectly clear portion in the corneae in most of these cases, and the decision with regard to the best site for the iridectomy was sometimes difficult to make. The contact glass devised by Gradle[5] for determining the corneal sector through which the best visual acuity can be obtained was not available. Because of the low visual acuity in our patients, the stenopeic slit proved to be less satisfactory than the initial stage of adrenalin mydriasis during which the dilation of the pupil is limited to the iris sector corresponding to the site of the adrenalin injection (Vannas[6]). These subconjunctival injections are usually made at three or four different places on consecutive days, and the visual efficiency of the eye is determined during the first five minutes after the injection. With regard to the surgical procedure, it has been our experience that any type of incision in or near the limbus adds to the opaqueness of the corresponding corneal sector. This is true

irrespective of the location of the incision with regard to the limbus and irrespective of the amount of trauma to, or dissection of, the conjunctiva. I have been afraid that a corneal chamber-opening incision made through the leucoma, as recommended by Desmarres, Wecker, and Kuhnt, may also add to the opaqueness of adjoining corneal portions. We have therefore adopted a technique of iridectomy in which the limbic incision is made to the left or to the right of the corneal sector which we consider the clearest. Let us suppose that the corneal sector between the 11- and 1-o'clock positions has been found the clearest; then we make our corneal incision either between the 9- and 11- or the 1- and 3-o'clock positions. To excise a portion of the iris through this "noncorresponding" incision is usually difficult. Hardly ever is it possible to pull the iris into the wound and perform the usual extraocular iridectomy. We usually grasp the portion to be excised with the iris forceps and then introduce the deWecker scissors into the anterior chamber behind the iris forceps, open the blades and, by gently pressing backward, get the portion to be excised between the blades of the scissors. Thus, a small elliptical iridectomy can usually be performed. The optical results obtained with this noncorresponding type of iridectomy have been better than those obtained with the usual technique, but irrespective of the technique it is still true that optic iridectomy scores its most valuable successes in cases of practical blindness.

904 West Adams Street.

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THE MANAGEMENT OF SOME COMPLICATIONS WHICH FOLLOW CATARACT EXTRACTION*

EDMUND B. SPAETH, M.D.
Philadelphia

This is a presentation of certain cases of postcataract complications which have occurred in the experience of the author over a period of several years. They are not the total list of complications which have occurred; many others, most of them relatively minor, are not mentioned herein simply because they are not unusual, and the greater number of such incidences have a fortunate outcome. While the majority of the cases cited here did not result in blindness, they are not presented to illustrate that fact, for other cases not greatly dissimilar to these in the practice of any ophthalmologist may be as fortunate, or the reverse, as these mentioned. The purpose of this paper and the detailing of the tragedies and the near-tragedies which appeared are: 1, to emphasize the grave complications which can occur; 2, to emphasize certain forms of therapeusis, surgical and nonsurgical; and 3, to enable us, if it is permissible, to draw certain conclusions from these experiences.

The cases that are presented here are two instances of severe traumatism, three patients with postoperative infections, three occurrences of subchoroidal hemorrhage, two happenings of sympathetic ophthalmia, five examples of iritis, some of them with secondary glaucoma, and four types of iris prolapse.

TRAUMATISMS

Mrs. M., aged 60 years, had lost the right eye several years prior from traumatism. She had an uneventful combined intracapsular extraction, under local anesthesia. The patient fell out of her bed early on the evening of the operation. She complained of pain in the eye. The dressing was removed, revealing the incision line widely open with an iris prolapse, and a hemorrhage into the anterior chamber. There followed immediate repair, resection of the prolapsed iris, and a conjunctival-flap closure of the wound. Present vision is 6/12 partly. Tension for the past three years has just barely been controlled with pilocarpine. The field remains stationary, with no loss of visual acuity beyond that present since the patient was first fitted with aphakia glasses. Repeatedly the pilocarpine has been omitted, resulting in a rather prompt recurrence of the ocular hypertension and with decreased visual acuity. This, however, returns to 6/12 as soon as the pilocarpine is again started.

Mr. M., aged 64 years, underwent uneventfully bilateral combined lens extractions, both intracapsular, at an interval of six weeks. Three months after the extraction of the left lens, the patient was struck in the left eye by the heel of a friend, while both were in bathing at the sea shore. There was hyphemia when he was first seen, choroidal detachment with a very possible subchoroidal hemorrhage, rupture of the incision line at the inner extremity, and complete loss of the anterior chamber. After posterior sclerotomy at the point of greatest choroidal-retinal elevation with release of some dark-red fluid blood, and atropinization, the patient underwent bed rest. Secondary glaucoma appeared very shortly thereafter. The tension was controlled with miotics plus dextrorototoric glaucosan while the patient was in the hospital. Tension was stabilized after four weeks. Vision was 6/5 with aphakia correction, with residual organized exudates in the lower part of the pupillary area, and with some hemorrhage still present in the inferior portion of the vitreous body even after four years. Low-strength pilocarpine solution is still being used. It is rather likely that pilocarpine will be necessary for a long time. Certainly, the case cannot be considered stable in the presence of the vitreous pathology. The marked herniation of the vitreous through the pupillary apparatus into the anterior-chamber angle which is seen here, is potentially a dangerous situation.

INFECTIONS

Mrs. C., aged 68 years, had a combined extracapsular lens extraction which was followed

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by good immediate postoperative results. Four days later an iritis developed, while over a period of four more days a thin crescent of hypopyon appeared (preoperative cultures were negative), and occlusio et seclusio pupillae occurred. The cornea was healthy, and tension was normal. Foreign-protein therapy plus atropinization was used, and in addition repeated subconjunctival injections of cyanide of mercury solution, 1:1000. The eye became quiet, with tension constantly normal; six months later a de Wecker iridocapsulotomy was performed. At the present time, the vision is 6/22, and the eye quiet. The patient had had no dental infections, and the lacrimal sac was normal. Diabetes was not present; the kidney function was good. Six months ago, the second (right) eye was operated on. Ocular recovery was equally stormy in this eye, hypostatic pneumonia developed four hours after this operation, and a similar iritis with hypopyon occurred. In the postoperative care of both these complications, it seemed that the use of very large doses of sodium salicylate by rectum in small starch-water enemas was definitely the most valuable procedure. The patient did not tolerate salicylates well, and did have general symptoms from their use, but in each instance recovery began two days after the injections were started. The patient when discharged from the hospital was in good condition. The hypopyon seems to suggest a true intraocular bacterial etiology.

Mrs. E., aged 76 years, underwent bilateral intracapsular lens extractions with peripheral iridectomies at a four-weeks interval. Recovery from the first operation was uneventful. Three weeks after the second operation, the patient developed tremendous pain and photophobia in the left eye. The cornea showed the presence of a typical herpetic keratitis—three tiny, superficial corneal blisters, two of them connected by a thin filamentous line deep in the corneal stroma, with this line radial to the corneal circumference, and very probably parallel to a corneal nerve. The condition became progressively worse, in spite of X-ray therapy, foreign-protein therapy, and local applications of iodine; even after, finally, actual cautery. The herpetic ulcers became necrotic, hypopyon developed, and the pain became so unbearable that a simple evisceration had to be done. The vitreous body showed some very slight infiltration at its most anterior portion. The patient returned to her home. Several months later, the patient was back in another hospital with an acute suppurative dacryocystitis on the same (left) side. At no time during her acute corneal condition had she shown any lacrimal-sac condition. Also, lacrimal irrigation had been done successfully shortly after the onset of the keratitis.

Mrs. C., aged 68 years, had a combined extracapsular lens extraction on the left eye. Eight days after the operation, the patient developed an intense acute iritis, with a very early development of a small hypopyon. The cornea was healthy, and the patient was edentulous. A small, suppurating hemorrhoid was discovered, and this was drained by a proctologist. Foreign-protein therapy was used, with atropinization and subconjunctival injections of cyanide of mercury, 1:1000 solution. The eye became quiet; later, visual acuity of 6/15 partly was obtained, following a de Wecker iridocapsulotomy, because of the organized exudate in the pupillary aperture.

Spontaneous subchoroidal hemorrhage

Mrs. F. F., aged 51 years, had bilateral complicated cataracts. The intracapsular extraction of the lens of the left eye was wholly uneventful under avertin anesthesia, with small peripheral iridectomy, and with a large conjunctival flap, and three conjunctival sutures. The immediate postoperative recovery was equally uneventful, with neither nausea, nor vomiting, and with no complaint of pain. At the end of the first dressing, 48 hours later, the anterior chamber was lost, and the wound open. Under the flap there was a small blood clot, still subconjunctival, and a lateral iris prolapse; in the pupillary aperture one could see the retina lifted upward and forward into a position typical of subchoroidal hemorrhage. The dressing was fairly dry and showed only one very small blood spot. An immediate posterior sclerotomy was done with the release of a large amount of very dark fluid blood. This was followed by an iridectomy, irrigation, and removal of the clot in the lips of the wound, and resuture of the incision line, using a conjunctival flap. After two weeks, the eye was quiet; vision was 6/9 with best aphakia correction. The slitlamp indicated the area of the posterior sclerotomy by dense tension lines in the vitreous chamber. Progressive retinal separation occurred, and at the present time the patient has a completely separated retina. More recently, an uneventful intracapsular extraction of the lens of the right eye with a complete iridectomy was performed under avertin anesthesia. A wholly uneventful recovery followed. The immediate correction with aphakia lens was 6/5. Three months after the operation, the patient returned for a recheck, with vision 6/12, field normal, and tension 36 mm. Hg. A corneoscleral trephining may be necessary in this case. The patient was not hypertensive, and had good kidney function, and no diabetes. Several years ago, however, the patient had had a condition which probably was encephalitis, with a slight degree of residual Parkinsonianism, and with very poor convergence. The left eye is undoubtedly a lost eye. The degree of retinal detachment is so

extensive that it does not seem wise to operate. It would be a physical impossibility to nullify by any transcleral surgery the traction effect of these tension lines which are seen so plainly in the vitreous, pulling the entire remaining vitreous body from the site of the posterior sclerotomy to the position of the cataract incision.

Mr. G., aged 71 years, had lost his left eye following a cataract operation in Russia. The right eye, with best correction, had vision of 2/150. A large mass of lens cortex and capsule was in the pupillary aperture, with multiple synechiae. The intraocular tension was normal. The patient was hypertensive, but this was rather well controlled. Diabetes was not present. Under local anesthesia, and with very poor coöperation on the part of the patient, a keratome incision was performed and with de Wecker scissors an iridocapsulotomy. Much lens debris was irrigated from the anterior chamber. Some fluid vitreous was lost. A clear and satisfactory pupillary aperture was obtained. The patient removed his dressings on the first postoperative night to go to the bathroom. The following morning he leaned over the edge of the bed to retrieve an orange, and the eye was still quite satisfactory, and with but little reaction. The third day he complained of pain in the eye, and again removed his dressings. He was examined immediately thereafter by the resident, and was found to have a classical subchoroidal hemorrhage, but the wound itself was still almost wholly closed. The anterior chamber was lost, the patient had great pain; there was ocular hypertension, and a mass bulged forward into the pupillary aperture. A posterior sclerotomy was done, within two hours, in his ward bed, with the release of a large amount of bright red blood. The patient's family were informed that the eye was probably lost. There followed rapid recession of all reaction, complete disappearance of the vitreous pathology; the fundus details appeared quite clearly, with no retinal separation, normal finger tension, and vision with aphakia correction was better than 6/22. His condition was satisfactory until the patient died from a cerebral vascular accident 12 months after his discharge from the hospital.

Mr. S., aged 69 years, had vision in the right eye of 6/32 to 6/45. In this eye there was a rapidly progressing incipient cortical cataract. Vision in the left eye was light perception, with hypermature lens and secondary glaucoma. The patient was hypertensive and had cardiac asthma which was well controlled by nitrites, iodides, and small doses of belladonna. For years the patient had slept with three to four pillows. A moderate degree of prostatic hypertrophy was present; some difficulty in urination. The kidney function was good, and the blood pressure at the time of surgery was 172/90. A wholly uneventful intracapsular lens extraction with a peripheral iridectomy was performed. The patient was comfortable, and the first 48 hours of convalescence were quite uneventful. There were no breathing difficulties, these being controlled with codeine, atropine, and the continuation of nitrites. No pain was felt at any time. The patient was kept in a semireclining position, repeated questioning assuring us of his comfort. The wound had been closed with a corneoscleral suture, and with three subsequent conjunctival sutures, so that there was no concern as to corneoscleral rupture from this posture. At the time of the first dressing, the upper lid was slightly swollen, the deeper portion of the dressing blood-tinged, the anterior chamber lost, and there was a dark blue-black clot under the conjunctival flap. In the pupillary aperture above, one could see shelving up from the depths of the fundus a subchoroidal hemorrhage which had lifted the choroid and the retina toward and into the pupillary aperture. The patient was informed of the diagnosis and of the seriousness of the condition, but immediate surgery was refused. The eyeball subsequently was eviscerated because of phthisis bulbi. The presence of good light perception above in this eye seemed to indicate the integrity of the retina below. It seems that this eye could have been saved with some usable vision had a posterior sclerotomy been done immediately for the drainage of the subchoroidal hemorrhage. Naturally, it is quite impossible to decide how much vitreous was forced out of the wound prior to the appearance of the clot, which naturally must have followed the vitreous. The case was hopeless, considering the fact that further immediate surgery was denied. It would have been utterly absurd to have made any guarantee whatsoever as to the outcome of the case contingent upon the permission to proceed with the posterior sclerotomy. Because of this impossibility, the eye was doomed, where otherwise it might have been saved.

Sympathetic ophthalmia

Mr. F., aged 70 years, had bilateral senile cataracts, and underwent an uneventful combined intracapsular lens extraction of the right eye. Three weeks later, the same operation was performed on the left. At this time, the right eye was quiet, practically white, with no appearance of the slitlamp beam in the anterior chamber; the fundus details were satisfactory; vision was 6/7.5 with a trial-frame plus 12 lens. At the time of the first dressing of the left eye there was a slight iris prolapse of the temporal pillar, which was immediately repaired; that is, by an iridectomy of the prolapse with a small conjunctival flap. Forty-eight hours later, some swelling of the upper lid

appeared, and marked Descemetitis with a strong aqueous beam flare. The right eye was still quiet. Forty-eight hours later, a sharp onset of a violent iritis occurred in the right eye, with rapid development of a thick, dull, nodular iris, rapid occlusion of the pupillary aperture, great pain and photophobia, rapid loss of vision, and a high degree of hypotension. The entire process advanced to this stage within 10 days from the initial onset. An enucleation was necessary for the right eye. There was complete recession of the inflammatory process in the left eye within the next four weeks. Therapy was huge doses of salicylates, foreign-protein therapy, uveal pigment intradermic injections, and subconjunctival injections of Pregl's iodine solution. Six months after the recession of this inflammatory process in the left eye, the patient developed a separation of the entire inferior portion of the retina. Surgery was not recommended, however. The vision of 6/30 to 6/45 with aphakia correction has held unchanged now for over three years. Histo-pathological study of the enucleated right eye showed "a marked iridocyclitic process with marked round cell infiltration that is very suggestive of sympathetic ophthalmia" (DeLong).

Mrs. M., aged 42 years, had bilateral dinitrophenol cataracts. Bilateral combined extracapsular extractions were performed, with complete iridectomies, and both were wholly uneventful. The interval between the operations was about four weeks. The resulting vision was, O.D., 6/6; O.S. 6/30; this latter because of some capsule remnants bridging the pupillary aperture. Discission with a knife needle was performed on the left eye four weeks later. Atropinization was used at this time. The tension was normal. Forty-eight hours later, the patient developed a very sharp iridocyclitis with severe Descemetitis, and with early occlusion and seclusion of the pupil. Foreign-protein therapy was instituted with large doses of salicylates. The patient's dental condition was normal. The nose and the nasal accessory sinuses were negative. A tonsillectomy was recommended, however, and was performed shortly thereafter. The inflammatory process continued to increase. Two weeks after the needling of the left eye, the patient developed a subacute iridocyclitis in the right eye, with a very extensive Descemetitis, the posterior corneal deposits being very large, moist, and almost white in color. Immediate enucleation of the left eye was recommended, and carried out. The process in the right eye continued to a complete occlusio et seclusio pupillae, but after the use of Pregl's iodine solution was started, the inflammatory process began to recede. At this time, the patient was discharged to her home and was started on foreign-protein therapy, using a preparation made from blood proteids. Atropinization was continued, and later the use of powdered dionin was introduced. The deposits upon the posterior surface of the cornea receded very slowly, but steadily. Six months after the onset of the inflammatory processes, these had disappeared wholly, and the eye was quite quiet. Her vision with best correction was 6/60. The patient was readmitted to the hospital, and a de Wecker-scissors discission done. There were no complications whatsover. Vision with best correction is now 6/9 full. There is no doubt but that this case might be one of ophthalmitis phacoanaphylactigenica rather than a true sympathetic ophthalmia, but the appearance of the inflammatory process in the second eye seems to indicate that the latter of the two possibilities is the more likely. The pathological report was, "a very extensive iridocyclitic process, with rather marked round cell infiltration at the root of the iris and within the ciliary body. Marked cellular infiltration of the vitreous, multiple subretinal exudates, and small hemorrhages."

Iritis and secondary glaucoma

Mrs. A., colored, aged 26 years, had a four plus Wassermann reaction. The patient had been under active treatment for over 18 months. She had bilateral posterior polar cataracts. Her history disclosed impaired vision since childhood, but she insisted that in the past two years the vision had decreased definitely. Slitlamp pictures are quite consistent with the history. The intraocular tension was normal with vision O.D. 6/45, O.S. 6/150. Discission of the right lens was performed, and was followed by an uneventful linear extraction one week later. No ocular hypertension appeared before the linear extraction. The extraction was followed by an acute, severe iritis, extensive Descemetitis, and intraocular tension rose to 48 mm. Hg. After atropinization, and the use of dionin and dextro-rototoric glaucosan, paracentesis of the anterior chamber was repeated five times. The eye became quiet, with a complete recovery. The patient's vision with aphakia correction is 6/6 full. Six weeks after this, a discission was done upon the left eye. Ocular hypertension appeared in this eye, before the linear extraction. The extraction was done upon the sixth postoperative day. The same sequence of events followed, with the same treatment as for the right eye. Six paracenteses were necessary before the tension became and remained normal. Complete recovery followed with the best correction permitting vision of 6/7.5 (partly). Both pupils were slightly distorted because of the iritic-vitreous synechiae; the pupillary apertures are quite clear. Antiluetic treatment was continued throughout the entire postoperative course. In this type of case not uncom-

monly a retinal separation develops after an interval of from two to eight years, and the case will have to be kept under observation because of that possibility. It is rather disquieting, in that the patient's optical correction is, in the right eye a plus six sphere with a medium cylinder, and in the left eye, a plus 5.75 sphere, with a medium cylinder. The patient apparently was moderately myopic prior to the lens extractions.

Mrs. Van T., aged 60 years, had had a preliminary iridectomy and a subsequent extracapsular lens extraction on the left eye, in another city, 12 months prior to the present acute condition in the right eye. Her vision with the left eye under best correction was 6/7.5. The pupillary aperture was a good, clear space; much cortex and capsule were present, and in recent weeks, she had developed considerable proliferation of lens epithelium. The eye, however, remained quite satisfactory with unchanging vision. Three weeks before the patient was seen, she had had a combined extraction upon the right eye. When first seen, the eye was intensely inflamed, the tension 72 mm. Hg, with masses of lens cortex in the eye, incarceration of the iris, and especially of some capsule, as seen with the slitlamp, over the entire length of the incision line. After admission to the hospital, two paracenteses of the anterior chamber were done within the following four days. Thereafter, under ether anesthesia, a keratome incision was performed with the release of the iris synechiae to lens masses, extraction of these, and irrigation of the anterior chamber. The iris was rigid and atrophic, without response to mydriatics or to miotics. The eye improved decidedly, but the tension remained between 30 and 40 mm. Hg. Repeated paracenteses of the anterior chamber were followed by a slow recession of the ocular hypertension to high normal. Four weeks after discharge from the hospital, the patient developed a typical bullous keratitis with a slight pathological rise in the intraocular tension. Admission to the hospital followed, and an immediate cyclodialysis was done. The marked atrophy of the iris, its rigidity, and the very fluid vitreous, as seen with both ophthalmoscope and slitlamp, made it seem unwise to utilize corneoscleral trephining, and quite impossible to do an iridencleisis. Even though there had been an inflammatory phase to this case, the tension responded promptly to cyclodialysis (usually a contraindication). One year later, there was a recurrence of the keratitis, but of a minor degree of severity, again accompanied by a rise in intraocular tension. Cyclodialysis was repeated. There has been no recurrence of either condition for three years. Vision, with best correction, holds between 6/12 and 6/15. The intraocular tension remains within the limits of the normal. The iris is depigmented, very atrophic, and immobile.

Mr. E., aged 68 years, had bilateral immature senile cataracts with vision O.D. 2/150, O.S. 6/30. His occupation was that of a type setter. He had an intraocular tension in both eyes that tended to ride at the top of the normal, but his fields of vision were definitely normal. The fundus details in the left eye showed no signs of glaucomatous changes in the nerve head. There was no hypertension, the kidney function was good, with no diabetes. Combined extracapsular extraction was performed, O.D., under avertin anesthesia. Postoperatively, three distinct anterior-chamber hemorrhages appeared within eight days, with a very fine persistent low-grade Descemetitis. Multiple synechiae developed with secondary glaucoma, which failed to respond to any therapy. Corneoscleral trephining was done on the limbus below at the six-o'clock position, under avertin anesthesia, with a rather prompt recession of all pathology. As soon as the eye was wholly quiet, a keratome incision was made, and an iridocapsulotomy done with de Wecker's scissors. Vision at the present time is 6/5 full, with best correction. The patient will have a corneoscleral trephining, or at least a cyclodialysis, done on the left eye before the lens is extracted therefrom. This was probably a case of primary glaucoma, and not of glaucoma secondary to lens changes. The postoperative iritis and the recurrent hemorrhages into the anterior chamber may, however, have been the cause for the postcataract-extraction glaucoma, confusing, thereby, the true etiology. In spite of this possibility, the confusion which exists here in differentiating a primary from a secondary form of glaucoma must be clarified. There is no doubt that the wisest policy would be to assume that this case of glaucoma is primary in nature, and should be handled as such.*

Mrs. J., aged 68 years, had bilateral senile cataracts: O.D., an extracapsular extraction; O.S., intracapsular extraction were performed, both with iridectomies. In the right eye the course was wholly uneventful; in the left, the extraction was accompanied by a presentation of vitreous before the lens was removed from the eye. The two extractions were approximately three weeks apart. The convalescence was quite the same for each eye, although in the left eye the patient developed a series of very tiny filtering subconjunctival fistulae in the line of the incision. The vision was 6/6 in each eye with best correction. One year later the patient returned, with the left eye

* Since the presentation of this paper, the patient has undergone an uneventful corneoscleral trephining on the left eye, with complete iridectomy.

in severe hypotension, with loss of the anterior chamber, and with grave impairment of the vision. The condition had been present for several days. The patient was kept under observation for some time, but it was impossible to determine the site of the aqueous loss—except that it was certainly continuing to drain from the anterior chamber. A conjunctival flap was lifted, the corneoscleral-incision line opened, and the lips very lightly touched with actual cautery. The recovery was quite uneventful, with tension normal and re-formation of the anterior chamber; vision returned to 6/30. At this time, a very thin, veillike opacification of the vitreous surface developed in the pupillary aperture, and then rather abruptly, a subacute inflammatory secondary glaucoma. Cyclodialysis was done after several days of fruitless alternation of various miotics and mydriatics. A satisfactory recovery followed with tension remaining below 20 mm. Hg, with vision 6/7.5 full, and with the pupillary-aperture vitreous veil unchanged. The case illustrates rather well the danger of closing abruptly a postcataract filtering cicatrix. This will be discussed further in the conclusion.

Mrs. D., aged 71 years, had bilateral senile cataracts, with vision O.D. 1/150, O.S. 6/30. The patient was mildly hypertensive (arterial), and this was not especially well controlled. An uneventful combined extracapsular extraction, O.D., was performed under local anesthesia. The immediate recovery was rather satisfactory, but postoperative reaction continued unusually long. The patient began to develop brief periods of ocular hypertension which responded well to the use of dextro-rototoric glaucosan, instilled and as subconjunctival injections. Salicylates were used in rather large doses. As the reaction receded there developed upon the surface of the anterior portion of the vitreous a lacelike network of delicate, many-pointed stellate opacities, none larger than 0.5 mm. in greatest width, and each connected with the other by fingerlike processes. (These looked very much like star-shaped congenital pupillary membrane rests which appear upon the anterior capsule of the lens, though not pigmented.) There was no Descemetitis, but a constant slitlamp-beam flare was present in the anterior chamber. These opacities became more dense, tended to fuse, one with the other, and then abruptly and very rapidly disappeared wholly. At the same time, a very high degree of asteroid hyalitis developed in this eye only. Atropinization was continued, with repeated use of glaucosan when hypertension appeared. The eye slowly became quiet, the tension was normalized, and the condition remained unchanged for four years until the time of the patient's death. Best correction with aphakia lens after full recovery was 6/7.5 good.

Iris prolapse

Dr. B., aged 65 years, had a senile cataract of the right eye. The patient was quite hypertensive, excitable, nervous, had an enlarged prostate and poor kidney function, and was practically completely deaf. An uneventful lens extraction was done with peripheral iridectomy under avertin anesthesia. Four days after the operation, an iris prolapse began to develop temporally. On the sixth day this was repaired with an iridectomy and a conjunctival flap brought down across the cornea obliquely. Several days thereafter and shortly before his discharge from the hospital, the patient had a similar prolapse beginning to develop on the nasal pillar. The eye was not hypertensive, but the patient was very difficult to control. Reparative surgery was declined, and the patient was dismissed from the hospital with 6/9 vision, but with a subconjunctival prolapse of the nasal pillar. Three months later, the patient returned to the hospital with a large blue cystoid cicatrix starting on the nasal pillar, bulging the cornea forward into an elipsoid; the cicatrix, which was not filtering, was about the size of a large pea. Under avertin anesthesia, resection was performed of the incarcerated iris, the lips of the defect in the corneoscleral incision line were touched with cautery, and the anterior juxtacorneal lip closed overlapping the posterioral scleral lip. A conjunctival flap completed the operation. No ocular hypertension was present. Recovery was good, but in the past two years there has been a slow, steady diminution in visual acuity due to a progressive interstitial opacification of the cornea, starting at the limbus and moving downward. The vision with best correction is now 6/60.

Mrs. C., aged 54 years, had bilateral rapidly advancing cataracts. The patient was edentulous, with good kidney function, and no arterial hypertension. She underwent an uneventful intracapsular lens extraction under avertin anesthesia, with a peripheral iridotomy. The immediate postoperative convalescence was good. The pupil was round, and atropine was instilled at the time of this dressing. On the third postoperative day, the patient awakened from sleep with a sharp pain in her eye, became quite apprehensive, and had a severe attack of vomiting. The eye was dressed shortly thereafter, and showed a hemorrhage into the anterior chamber, and a large iris prolapse. Immediate reparative iridectomy and conjunctival flap were performed, with a subsequent uneventful convalescence and recovery. The vision was 6/4 partly, with best aphakia correction. The patient, however, was definitely aware of an unusual sensitivity to light, caused probably by the large iridectomy necessarily made by the

reparative surgery. It is rather interesting that her surgery in the opposite eye, which was done several months later, took an absolutely similar course, though, in this instance, a complete iridectomy was done at the time of the surgery. Also, the iris and anterior-chamber hemorrhage which occurred were marked at the corneoscleral incision, and this was spread in spite of conjunctival sutures. In each instance, the pain from the hemorrhage was followed by nausea and vomiting, according to the patient's story. The nurses, however, and the resident in attendance on the case are equally insistent in their statement that the nausea and vomiting preceded the pain, and they feel that the complications as they occurred were the result of this.

Mr. G., colored, aged 68 years, was blind in the left eye from neglected hypermature cataract, and the right eye had a high-degree nuclear cataract. The intraocular tension was normal, and the patient mildly hypertensive. There was considerable dental focal infection. This was eradicated prior to his surgery. An uneventful intracapsular lens extraction was performed, with complete iridectomy under avertin anesthesia. The postoperative convalescence was uneventful, except that the pupil responded very poorly to cycloplegics (or mydriatics) in dilation. There was no iris prolapse at the time of his discharge from the hospital. The patient was discharged two days before New Year's evening. While attending a New Year's Eve party, he became intoxicated, and in a good-natured scuffle which occurred, was struck in the eye that had been operated on. He reported to the hospital the following morning with some fine streaks of hemorrhage upon the iris below, and with a tiny prolapse of the iris of the temporal pillar. The iris prolapse was corrected by the application of the actual cautery, without recurrence. The eye, however, continued irritated and painful for some time. There was no hypertension at any time. Three months later, although the eye was white and quiet, one could see, with the slitlamp, a very definite anterior synechia above at the limbus at the site of the prolapse with the remains of some rather deep corneal vessels still present. Three months later the eye was unchanged, and the vision still holding at 6/9. Peridectomy was seriously considered because of this vascularization of the cornea, but the hospital lost track of the patient.

Mr. L., aged 65 years, was insane. The diagnosis was senile dementia, with high degree of senile cataract. An uneventful intracapsular lens extraction, O.D., was performed with iridectomy under intravenous evipal anesthesia. Uneventful recovery followed. The left eye was similarly operated on. The same anesthesia was used. At the time of the first dressing, the patient showed a rather marked iris prolapse, with spreading of the incision line. Uneventful reparative surgery, iridectomy, and conjunctival flap were performed. Forty-eight hours later, this (O.S.) eye showed all the signs of an intense and very acute iridocyclitis, with a high degree of Descemetitis, intense pain, a nodular iris, and with a very rapidly developing seclusio et occlusio pupillae. Vision failed rapidly. A prompt enucleation was carried out, for everyone concerned felt that this case was potentially one of sympathetic ophthalmia, and that the eye should be removed from a prophylactic standpoint. The patient had been operated on to facilitate his institutional care, and, considering this fact, it seemed logical to have a seeing one-eyed man rather than to attempt to save the eye and possibly lose both thereby. The histo-pathological report was that of "severe acute iridocyclitis, iris incarceration, iritis, multiple minute hemorrhages scattered throughout the ciliary body and into the retina; these were especially noticeable in that portion of the retina immediately posterior to the ora serrata."

Conclusions

The cases of traumatisms, postoperative infections, subchoroidal hemorrhages, sympathetic ophthalmia, iritis with secondary glaucoma, and the all-too-common cases of iris prolapse, seem to suggest the following important points for serious consideration:

1. Severe postoperative traumatisms, when they occur, leave an eye which is never quite satisfactory thereafter. Further, these traumatisms should be preventable. The multitude of possibilities which can occur are almost absurd, but it is well worth our effort to guard against them in every way possible.

2. Cases of postoperative infection, when they develop, need not be hopeless. There is no doubt that a massive vitreous abscess results in a loss of the eyeball, but early and vigorous therapy has repeatedly saved eyes which would have been lost failing such therapy. The etiology of the infection is occasionally difficult to determine. Preoperative negative cultures do not guarantee the absence of a later infection in some instances. In one case, a

definite fault existed with the surgeon in his failure to discover, before the operation, the suppurative lesion which was responsible for the postoperative infection.

3. Subchoroidal hemorrhage, when it occurs with an uneventful cataract extraction, is frequently an unpredictable complication. There is no doubt that vitreous loss does predispose to it. Such cases are not included at this moment. In some instances, there may be hope for a good eye by further surgery, but that must be immediate. Evisceration of an eyeball because of a hemorrhage precludes vision. Conditions short of this are increasingly hopeful as the extent of pathology is decreasingly severe. When one stops to think of the extensive vascular distribution of the choroid and the abrupt changes which have occurred in the pressure differences between the choriocapillaris and the intraocular pressure following a cataract extraction, it seems almost miraculous that so few cases develop subchoroidal hemorrhage—or a subretinal hemorrhage (to be histopathologically exact). It is rather interesting and significant that repairs which are occasionally necessary following a cataract operation because of iris prolapse are seldom, if ever, followed by a subchoroidal hemorrhage; this in spite of the fact that probably 50 percent of such repairs occur in patients whose initial surgery has been complicated, or whose postoperative course has been unsatisfactory.

It is relevant that iris prolapse occurs most frequently in those procedures which are done through an intact sphincter, even though a peripheral iridotomy had been a part of the extraction technique (the major number of such procedures are intracapsular extractions). These repairs are always difficult. They must be done under local anesthesia, the eye is sensitive, anesthesia is not always satisfactory, and the patient is not infrequently apprehensive—a series, or group, of conditions which predispose to the loss of some vitreous. It would seem that the earlier surgery—that is, the lens extraction—is the safeguard against a subchoroidal hemorrhage at the time of the secondary surgery. The difference between the intraocular pressure, extravascular, and the intravascular pressure, still intraocular, has adjusted itself as a result of the prior opening of the eyeball. In addition, in many cases a subsequent constant aqueous loss accompanies the iris prolapse. Both of these are important in adjusting this hydrostatic-pressure differential.

4. Sympathetic ophthalmia does occur after cataract extractions, and, popular opinion to the contrary, an enucleation of the primarily involved eye did help after the process was established; and the secondarily involved eye was not the poorer of the two, pathologically speaking, when treatment was completed to the final results. One of the cases presented here does illustrate a certain important and relevant point, that must be included herein. It is in regard to the use of trichloracetic acid, or the actual cautery for the treatment of slight iris prolapse. The practice is universal, and is successful in a large number of cases without consequent damage or ill effects. In spite of this, sympathetic ophthalmia following such procedures occurs not commonly, but still not rarely. It seems that this procedure should be relegated to the limbo of the obsolete.

5. Iritis, postoperative, with its resulting glaucoma, is still the *bête noir* of the surgeon. Specific reasons for the average nontraumatic anterior-chamber hemorrhage are unknown. Diabetic patients postoperatively are more prone to develop hemorrhages than are other patients. Also, it seems as if those patients who need large doses of insulin to control

their blood sugar adequately are more likely to develop these hemorrhages. With the exception of traumatic cases, those patients with arterial hypertension naturally well controlled do not seem to develop anterior-chamber hemorrhages more commonly. Prevention of this ought to be far more important than its treatment after it has developed. Further, one must be most meticulous in differentiating, preoperatively, a primary compensated glaucoma from a secondary glaucoma due to lens swelling. Simple noninflammatory glaucoma must be adjusted first; if not, subsequent more difficult glaucoma surgery will be necessary, and while many of these cases may have a good final outcome, this satisfactory outcome will not be reached for quite a long time. It seems that repeated anterior chamber paracenteses are the most valuable procedures at hand for the treatment of the true secondary iritic glaucoma. It is rather fortunate that in such instances, permanent damage to visual acuity seems to be appreciably delayed. Certainly, in these cases failure in visual acuity seems to be retarded in comparison with cases of similar severity which are probably primary in nature.

6. Minor traumatisms seem to precipitate iris prolapse. Of this there is no doubt. Other things being equal, a complete iridectomy does not prevent the formation of subsequent prolapse. The complication occurs only after the formation of the anterior chamber has started. Regardless of whether the sphincter is intact or not, any situation which impairs the free flow of aqueous from the posterior chamber through the pupillary aperture into the anterior chamber means a possible iris prolapse. Under certain circumstances, an intact sphincter could be such a cause. A peripheral iridotomy or iridectomy at the root of the iris should and probably does protect the average case. Postoperatively, conjunctival corneoscleral sutures will not, in 100 percent of instances, prevent an iris prolapse, although there is no doubt whatsoever that these do decrease decidedly the incidence of this complication. An unruly patient with resulting delayed formation of the anterior chamber will commonly develop an iris prolapse. The strain of vomiting is a common cause. The period at which it occurs is not in the first 24 hours of postoperative convalescence, however, but at some time after that. Any iris prolapse, no matter how small, must be corrected before the patient leaves the hospital. A single case of cystoid cicatrix will convince one of this. Cauterization, either with the actual cautery or with caustic solutions, may correct the external manifestation of an iris prolapse, but it does not correct the anterior-chamber-angle root synechia that develops, and this condition is perhaps even more serious than the initial prolapse itself. An open incision, resection of the prolapsed iris, and a spatula return of the pillar of the iris colobomata into the anterior chamber are essential components of a satisfactory correction of this complication. This subject was mentioned above under sympathetic ophthalmia. Repetition is made here to add further condemnation to the practice of cauterizing with chemicals or with actual cautery a prolapsed iris, unless the pillars thereafter can be wholly replaced into the anterior chamber. Reparative surgery is not without danger of sympathetic ophthalmia; and while it must be adequately done, by the same tenets it must be properly done. The technique of reparative surgery is difficult, and demands dexterity and surgical acumen frequently far more exacting than that necessary for the original operation. The last case presented to illustrate iris prolapse was probably one of true sympathetic ophthalmia. The prompt enuclea-

tion which was carried out (for the reasons consult the case history) prevented any damage to the previously operated on and satisfactory right eye. Filtering fistulae, whether or not connected with an iris incarceration resulting from an iris prolapse, permit the development of an ocular hypertension which of itself is not dangerous. This, however (Langdon), probably results in a readjustment of the fluid excretory mechanisms of the eyeball. If later it should become necessary to correct surgically such filtering cicatrices, because of dangerous and disabling hypotension, there is a grave danger of subsequent hypertension because of the upset of this compensatory adjustment which has developed. These instances present delicate surgical situations, and if surgery is necessary, as in the case detailed, then very careful postoperative observation is doubly important.

7. It seems that the important portion of cataract surgery is not alone the performance of the extraction itself; of equal concern are adequate preoperative preparation and careful, meticulous, well-outlined, and ever vigilant postoperative observation.

1930 Chestnut Street.

CONJUNCTIVAL LESIONS IN TUBEROUS SCLEROSIS*

T. H. Luo, M.D.
Peking, China

Tuberous sclerosis is a congenital anomaly, frequently appearing as a hereditary or familial disorder and characterized by mental deficiency, epilepsy, and especially the occurrence of tumors in various parts of the human body. Von Recklinghausen was generally credited to have given in 1863 the earliest description of a patient who showed sclerotic areas in the brain and myomas in the heart muscle. Bourneville[1] was, however, the first to recognize the condition as a pathological entity when he described a rare form of cerebral sclerosis observed at autopsy occurring in young, mentally deficient and epileptic patients. From the potatolike shape of the sclerotic patches in the brain he originated the term tuberous sclerosis, but the disease has been also commonly known as Bourneville's disease. In spite of the early pathological reports, the clinical syndrome was not established until 1908 when Vogt[2] described it as characterized by adenoma sebaceum, mental deficiency, and epilepsy.

Subsequently, many case reports on this condition have appeared in the literature, bringing to light new manifestations and the variability of its symptoms in different patients. Tumors occurring in various organs of the body such as the brain, ependyma, kidneys, heart, skin, pancreas, intestine, thyroid gland, and others have been described, and according to Stewart and Bauer[3] they may be undifferentiated embryonic neoplasms, gliomas, hemangiomas, lipomas, myomas, fibromas, mixed tumors, teratomas, dermoid cysts, or carcinomatodes. On the skin the chief manifestation is the facial adenoma sebaceum described by Pringle[4] upon which the diagnosis of this disease is frequently based. It consists of a nodular, red, yellowish-red, or brown rash distributed in a butterfly fashion over the nose and cheek. In addition to it, other cutaneous abnormalities have been recorded.[5] The more important ones are the fibromata, pigmentary disorders especially in form of oval or circular brown areas known as "café au lait," and the so-called shagreen patch occurring commonly over the lumbo-sacral region as an uneven thickening of the skin of about a palm's breadth and elevated slightly above the surrounding surface. In the skeletal system, van der Hoeve[6] stated that Pincherle and Horniker found with X rays "osteoporosis and pneumatization of the skull bones and vascular enlargements in the vessels of the diploe." Gottlieb and Lavine[7] reported on X-ray evidence peculiar mottling in the skull, destruction of the cortical architecture, osteoporosis, and periosteal thickening of the skull and the metatarsal and metacarpal bones and their associated phalanges, and areas of marked rarefaction suggesting small cysts in several of the bones of the hands. Lesions of the mucous membrane were also encountered. Carol and van Heusden[8] mentioned the occurrence of fibromatous proliferations on the mucosa as small, slightly elevated tumors, solitary or grouped together, blue-red or colored like the surrounding tissue. They are seen on the gingiva, the buccal mucosa, the hard palate, the inner side of the upper lip, the anterior palatine arch, the uvula, and the back of the tongue. Associated with these different manifestations there may be present other con-

* From the Department of Ophthalmology, Peiping Union Medical College.

genital anomalies such as spina bifida, ectopia testis, horseshoe-shaped kidney, and so forth. Finally, lesions in the eye form an important part in the symptomatology of this disease.

Ocular lesions were first described by van der Hoeve in 1921.[9] It is remarkable that he saw peculiar tumors in the retina of each eye in his six patients suffering from tuberous sclerosis. Following him, a number of reports of retinal tumors in tuberous sclerosis appeared in subsequent years so that in 1937 Messinger and Clarke[10] were able to collect 24 cases from the literature. Among these, five patients had, in addition to retinal tumors, tumors of the optic disc. To this list, they added a case of papillary tumor with ophthalmoscopical and histological findings. In the same year, Carol and van Heusden[8] reported two patients with tuberous sclerosis who had tumors in the fundus, and in 1938 Block and Grove[11] published another case of retinal tumor in this disease.

Ophthalmoscopically, lesions of the optic disc consist of whitish, nodular growths extending into the vitreous. On the papillary tumor there may be small buds which become pinched off, float in the vitreous, and land somewhere on the retina. Sometimes hemorrhages appear in the tumor or the tumor may burst with escape of blood or fluid. Such occurrences were actually observed by van der Hoeve.[9] The retinal changes show a variety of appearances. They are ordinarily described as oval or circular areas, white or gray in color, situated away from the disc, usually showing no relationship to the blood vessels and provoking no reaction in the surrounding tissues. Sometimes they are nodular with a white mulberry surface protruding into the vitreous. According to Messinger and Clarke[10] Salom listed four types of retinal changes: (1) yellowish-red spots; (2) blurred pigmented spots; (3) clearly outlined nevoid spots and nevi; and (4) pigmented changes identical with those of pigmented retinitis. Fleischer, in discussing van der Hoeve's report on a fourth type of phakomatosis,[12] remarked that the retinal lesions may be manifested as small, round, white, atrophic foci situated in the peripheral portions of the fundus and resembling atrophic post-inflammatory changes. Therefore great care and thoroughness should be exerted in examining the fundi of patients with tuberous sclerosis in order not to miss minute or seemingly unimportant lesions.

The pathological features of the papillary and retinal tumors are essentially alike. According to van der Hoeve[9] they were made up of neural fibers or neurocytes or both. The latter are cells of embryonic retina which have not differentiated into glia or ganglion cells. He believed that these tumors were derived from embryonic cell rests and proposed to call them neurocyto-phakomata or neuro-fibrillo-phakomata from the Greek word, phakos, meaning mother spot. Later workers, however, found glial fibers and could not confirm van der Hoeve's description of nerve-fibers in such tumors. Messinger and Clarke,[10] from a review of the literature, the histological studies in their case, and a consideration of the embryology, felt that they were essentially gliomatous.

Besides phakomata in the retina and the optic disc, adenoma sebaceum or other tumors of the skin may occur on the eyelids in tuberous sclerosis. A search of the available literature, however, failed to reveal any description of conjunctival lesions such as are shown in the following report.

Case history

Mrs. Y. E., a Chinese housewife, aged 37 years, was admitted to the medical

service of the Peiping Union Medical College Hospital on December 15, 1939, for nodular lesions on the face of unknown duration and abdominal discomfort of about 1½ years' duration prior to admission. The right eye had become blind about five years ago. No detailed history of the ocular disease causing the blindness and no family history of similar disease were obtained.

During her hospitalization in the medical service, she was found to have mental deficiency, typical adenoma sebaceum of the face, subungual and other fibromata of the skin, grayish, slightly elevated spots on the buccal mucosa, and signs of a tumor of the right kidney or liver. Biopsy of the facial lesion revealed proliferation of the sebaceous glands, increase of the hair follicles, and absence of the elastic tissue, while in the biopsies of the subungual tumor and the skin nodule on the back, hyperplasia of the collagenous fibrous tissue formed the chief pathological change. These findings indicate that the patient was definitely suffering from Bourneville's disease. The detailed results of the general examinations and special investigations made on the patient will be published by Professor I. Snapper of the Medical Department.[13] The present report is confined to the ophthalmological findings.

The eyelids were normal. On the conjunctiva of both lower lids, situated symmetrically near the lid margin, about 6 millimeters inside the external canthus, were two small tumors (fig. 1). These were about 4 millimeters in diameter, grayish white in color, and slightly elevated above the surrounding conjunctiva. Their surface was smooth and flat. They were found to be slightly pedunculated, as a probe could be introduced for a short distance underneath the edge. A smaller conjunctival growth of similar character was present close to the left upper lid margin at approximately the junction of the inner and middle thirds of the lid. Besides, the conjunctivae of the lids showed mild papillary and cicatricial trachoma. (For figures 1 and 2 see frontispiece.)

The cornea of the right eye was small, flat, and densely opaque, the greater part being occupied by leucoma adherens. The right eyeball was atrophic. The bulbar conjunctiva of the left eye, the cornea, anterior chamber, iris, pupil, and lens were essentially normal. Vision was 6/10, Jaeger 2. Fields of the left eye were normal for form and for red.

Fundus examination of the left eye revealed clear media. The optic disc was distinctly normal. The retinal vessels, macula, and periphery of the fundus were normal. The fundus was tessellated. Accompanying the superior and inferior temporal retinal vessels the nerve fibers appeared to be slightly myelinated. About 2 P.D. nasally to and above the disc there was a small whitish patch with definite striations suggesting medullated nerve fibers. About 4 to 5 P.D. in the same direction away from the disc was seen another whitish patch, oval in shape and about one-third P.D. by three-fifths P.D. in size (fig. 2). It was situated by the side of the superior nasal vein, which appeared to be slightly veiled by it. Its margins were ill defined and its surface was flat and homogeneous, showing no striations by repeated examinations.

As the right eye was phthisical, enucleation was performed on November 13, 1939, and, during the operation, the conjunctival lesion of the right lower lid was removed for histological study.

Pathological findings: The right eyeball was distorted in contour, measuring only 13 millimeters in its anteroposterior diameter, 14 millimeters in its vertical diameter, and 14.5 millimeters in its horizontal diameter. The cornea was opaque,

flat; and measured 9.5 millimeters horizontally and 5 millimeters vertically. It was practically entirely replaced by scar tissue with incarceration of iris pigment at places. The sclera was shrivelled and irregularly thicker than normal. The iris was extremely atrophic and in large part adherent to the pseudo-cornea. The ciliary body was drawn toward the vitreous cavity by a dense cyclitic membrane behind the lens. The choroid showed extensive ossification. The retina was totally detached and atrophic, being pulled back behind the cyclitic membrane. The optic nerve head was also drawn in and showed areas of fibrosis. The site of the lens was occupied by a bony mass. No neurocytophakoma or neuro-fibrillo-phakoma was found.

The conjunctival specimen consisted grossly of a small piece of whitish, fairly firm tissue. Microscopically, part of a normal tarsus and a tumor mass were seen (fig. 3). Lining the tarsus was hypertrophic conjunctival epithelium with fairly marked papillae formation. Downward extensions of the hypertrophic epithelium formed round or irregular masses, some of which appeared to be separated from the surface and to have central empty lumina or a network of central degenerated cells, resembling glandular structures. These changes were evidently produced by trachoma. There was, however, practically no subepithelial cellular infiltration.

Connected with the tarsus by a very short peduncle was a small tumor. The bulk of the tumor was made up of collagenous connective tissue. It was covered on its surface by one to several layers of epithelial cells. In certain sections were seen tubules or cords of epithelial cells extending from the surface down to the mass. In other sections, pseudo-glandular structures such as are described in the previous paragraph were present inside the mass, showing apparently no connection with the surface.

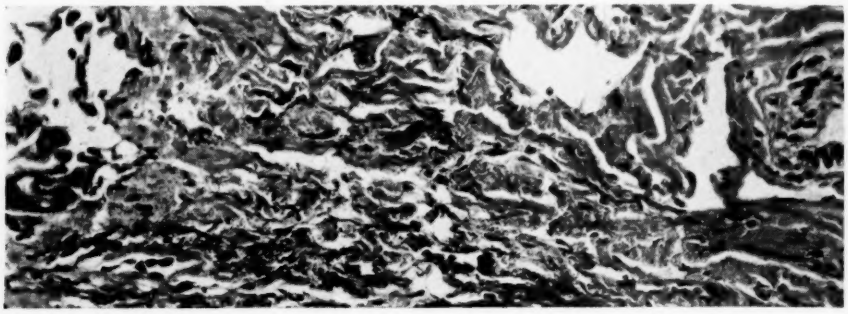

Fig. 3 (Luo). Photomicrograph, low power, showing the conjunctival tumor attached to the tarsus.

With Verhoeff elastic tissue stain, it was shown that there were no elastic fibers within the tumor while the elastic fibers normally present in the subconjunctival tissue or tarsus were seen to stop quite sharply at the junction between the tarsus and the growth (fig. 4).

Comment

The white patch in the left fundus of the patient is obviously not the characteristic, tumorlike change observed in tuberous sclerosis. However, the patient is definitely suffering from this disease, in which the retinal lesions are known to

give rise to diverse ophthalmoscopic appearances. Therefore, any change in the retina, unless some other definite cause can be assigned to it, should be seriously considered to be related to the disease. Moreover, a similar white spot in the retina was observed by van der Hoeve and was later proved to be neurocytophakoma by histological studies. Since no other pathologic process can be held responsible for the occurrence of the patient's retinal lesion it seems justified to classify it as phakoma.

The conjunctival lesion is characterized by proliferation of collagenous fibrous tissue with absence of elastic fibers. These tumors are analogous to the fibromatous proliferations on the mucous membrane of the mouth and the fibromata of the skin, being derived from cells normally found *in situ*. To follow the terminology of van der Hoeve, they may be called fibrophakomata conjunctivae.

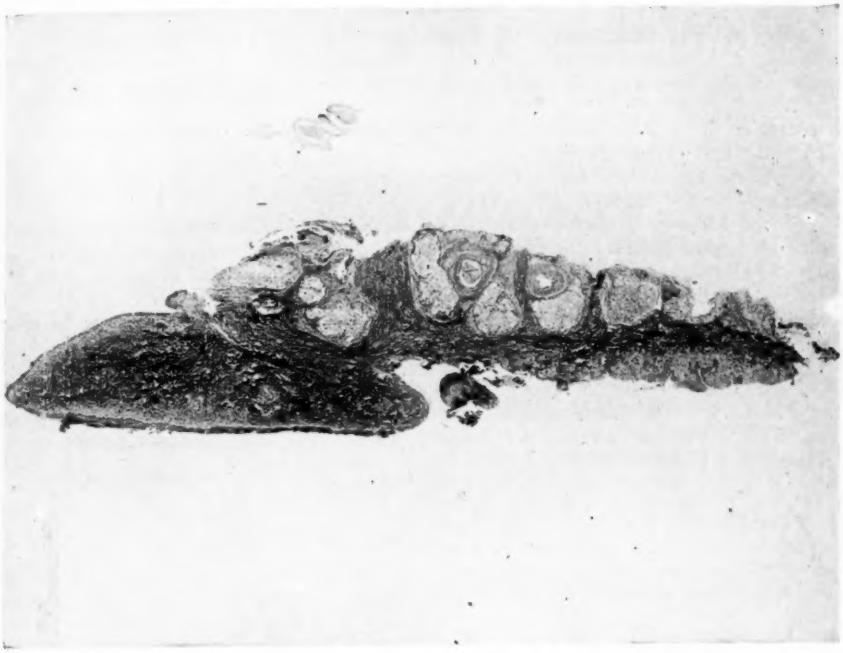

Fig. 4 (Luo). Photomicrograph, high-power view of the region containing partly the tarsus and partly the tumor, to show the presence of elastic fibers in the former and their absence in the latter (Verhoeff elastic-tissue stain).

Summary

In a Chinese female patient with tuberous sclerosis the conjunctiva of the eyelids showed a few small grayish-white, slightly pedunculated tumors. One of the tumors was removed and was found on histological examination to consist of hyperplasia of collagenous fibrous tissue without elastic fibers. In addition to the conjunctival lesions the patient had a white patch in the left retina, which was believed to be a phakoma.

I wish to thank Professor I. Snapper, head of the Department of Medicine, for his permission to report this case from his service.

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NOTES, CASES, INSTRUMENTS

EXTERNAL OPHTHALMOPLEGIA*

A CASE OF MYASTHENIA GRAVIS

HAROLD R. SNIDERMAN, M.D.
Toronto, Canada

Cases of myasthenia gravis occur in which the symptoms remain confined to the ocular muscles,[1, 2] or spread to other parts of the body only after periods of months or years. The majority of reports of this condition have been made by neurologists, but since ptosis or diplopia is usually the earliest symptom in these cases, the ophthalmologist is the first to be consulted.

Posey[3] states, ". . . according to Uhthoff, ptosis is present as the first symptom in over 50 percent of the cases and is absent in only 18 percent of all cases. The external ocular muscles are involved in 30 percent of all cases, the involvement varying from a slight weakness to absolute paralysis. The internal muscles of the eye are not involved in this condition."

The ophthalmologist should suspect the possibility of myasthenia gravis when consulted upon a case of diplopia or ptosis. He may not be able to differentiate it from other causes of ophthalmoplegia, which is usually the work of the neurologist, but should make use of the diagnostic value of prostigmin, orally or hypodermically, in making the diagnosis.

In 1934, Mary B. Walker[4] used physostigmine, the nonsynthesized drug similar in chemical formula to prostigmin, to treat a case of myasthenia gravis. It caused a striking temporary improvement on the paralyzed muscles and an ophthalmoplegic patient was able to open her eyes within a few minutes. Pritchard[5] used prostigmin in treating patients with myasthenia gravis and in each case there was a definite improvement within five minutes after the injection, and within 30 minutes there was more improvement than with any other known treatment.

To quote Myerson,[6]

> The activity of an organ involved by autonomic stimulation is the result of a balanced activity between acetylcholine, which is produced by the parasympathetic nervous system, and the more hypothetic series of chemical substances produced by the sympathetic nervous system, at the neurovisceral junction, called sympathins.
>
> Esterases are substances produced either by reacting cells or by the tissues in general. These substances and especially choline-esterase are believed to hydrolize or destroy acetylcholine and consequently make the action of the parasympathetic system intermittent.
>
> Prostigmin (dimethylcarbamic ester of m-oxyphenyl-trimethylammonium methylsulfate) enters into such a chemical union with either acetylcholine or mecholyl so as to stabilize it, or with the esterases so as to prevent their action on mecholyl, and consequently enhances the effect of this drug. It is therefore a synergist of mecholyl and acetylcholine.

Prostigmin, which does not exist in nature, was first synthesized in the chemical laboratory by Aeschlimann and Reinert[7] in 1931.

The work of Dale and Feldberg[8] strongly suggested the liberation of acetylcholine by the normal transmission of excitation from motor-nerve endings to the voluntary-muscle fibers. They explained myasthenic weakness in terms of disturbance of acetylcholine liberation or destruction, in view of the effect of prostigmin on the clinical weakness and on the characteristic myogram of myasthenia gravis.

Viets and Schwab,[9] Gammon and Scheie,[10] Viets, Schwab, and Mitchell,[11] Thorner and Yaskin,[12] and others have reported on the value of prostigmin as a

* From the Department of Ophthalmology, Cincinnati General Hospital.

diagnostic test of myasthenia gravis, in differentiating it from cases of muscular dystrophy, amyotropic lateral sclerosis, generalized weakness, progressive bulbar palsy, and meningo-vascular syphilis with ptosis, which simulated myasthenia gravis.

Viets, Schwab, and Mitchell[11] have used a method of scoring their patients according to the response to physostigmine. At stated intervals of 10 and 30 minutes, and at 1, 2, and 4 hours (and occasionally 6 or 8 hours) after injection, they record the changes in the paralyzed muscles and the subjective changes in the patient. The objective and subjective changes are recorded on a schedule of from 1 to 4 points for each period. If all changes are maximal the score is 4, and so on. Their average score for all cases of myasthenia gravis was about 30. In conditions other than myasthenia gravis the average score for 27 patients was 1.5 and no score was over 4 or 5.

As far as can be determined from reports only cases of myasthenia gravis are benefited by prostigmin, either hypodermically or orally.

Paleari[13] reported six patients aged 24 to 60 years affected by myasthenia. In all cases the ocular symptoms were the first to appear and in three cases these symptoms of the disease remained isolated for a long time before the general symptoms became manifest. The ocular symptoms were in the form of paresis or paralysis of a few or all of the eye muscles, starting with ptosis and vertical diplopia. Paleari mentions that if the genesis of similar, isolated ophthalmoplegias is obscure, causing errors of interpretation, it will become clear under the action of prostigmin, which abolishes the motor disturbances in the myasthenia syndrome.

TABLE 1

SHOWING THE EFFECT OF THE PROSTIGMIN INJECTION ON THE PTOSIS AND THE OCULAR ROTATIONS

	Palpebral Fissure		Ocular Muscles	Symptomatic Aid
	Rt.	Lt.		
At rest	8 mm.	10 mm.	Marked weakness of all ocular muscles.	
3 c.c. 1:4000 prostigmin and 1/200 gr. of atropine sulphate hypodermically				
10 min.	10 mm.	13 mm.		
1 hour	13 mm.	14 mm.	Excellent rotation of both eyes to the left. Improved movement of eyes to the right. Improved elevation of both eyes.	Marked improvement of local and general well-being.

CASE REPORT

T. T., a white laborer, aged 27 years, was first seen at the Cincinnati General Hospital in January, 1939. His wife had a positive Wassermann test, and the patient came to the hospital for a blood test and to see if anything could be done to help his eyes. He complained of ocular fatigue and frontal headaches. In childhood the patient had had measles and whooping cough. In 1918, during the influenza epidemic, he was very ill; the details of the illness were not remembered except that he couldn't eat for several days. A short time later, he noted that both upper lids drooped and he often

bumped into objects. Improvement in the lid droop gradually occurred and the vision remained quite satisfactory.

Physical examination. A well-developed, well-nourished white man, not acutely ill, had as the most striking characteristic a sleepy expression, caused by a drooping of both upper lids. Except for the eye examination, the symptoms were all negative. The blood and spinal-fluid Wassermann examination was negative.

The uncorrected vision was O.D. 20/25, O.S. 20/30. There was a paresis of both superior levator palpebrae muscles, more marked on the right side, and a bilateral weakness of the superior rectus muscles, and of the internal and external recti muscles. There was a paralysis of convergence. The pupils were round, equal, 5 mm. in diameter, and reacted well to light, accommodation, and consensually. The lens and media were clear, and the fundus examination negative.

The palpebral fissure at rest on the right side was 8 mm. vertically and on the left side 10 mm. The patient was given 3 c.c. of 1:4,000 prostigmin and 1:200 atropine sulphate hypodermically.

Ten minutes after the injection the right palpebral fissure was 10 mm., and the left 13 mm. At the end of one hour the patient was able to open the right palpebral fissure 13 mm., and the left 14 mm. At the 10-minute-examination he was able to move both eyes moderately to the left, right, and upwards. At the end of one hour he was able to move his eyes almost perfectly to the left, the movement to the right was greatly improved, and the eyes could be elevated 4 mm. above the horizontal plane. Symptomatically the patient was markedly improved.

The patient was followed in the outpatient clinic for one month while taking prostigmin by mouth. The eye condition was markedly improved and his general condition excellent. He failed to return after this and we were unable to locate him.

The patient had been admitted to the hospital for an investigation of his lid ptosis and ocular-muscle paresis which had been present since he was seven years of age. The case was thought to be either a postencephalitic condition with involvement of the 3d, 4th, and 6th cranial nerves, or a manifestation of myasthenia gravis. The neurologic examination was negative except for the ocular findings of bilateral external ophthalmoplegia. Prostigmin was used as a therapeutic test. It was used with and without atropine and there was marked improvement in the ocular condition in both tests. The immediate and prolonged improvement of the ptosis and ocular movements, as well as the subjective improvement of the patient following the injection of the prostigmin, indicated that we were dealing with a case of myasthenia gravis.

Summary

A brief review of ocular findings in cases of myasthemia gravis is given. The development and use of prostigmin in the treatment and diagnosis of myasthenia gravis are mentioned. The value of prostigmin in the differentiation of ophthalmoplegias by the ophthalmologist is stressed.

A case of external ophthalmoplegia is described in which the final diagnosis was made by the therapeutic test of prostigmin injection.

73 Poplar Plains Crescent.

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CEREBELLAR HEMANGIO-BLASTOMA

Late results of operations

Edward Jackson, M.D., D.Sc.
Denver, Colorado

The late results should be reported for any capital operation performed to prevent blindness. J. L. S., aged 13 years, was seen in 1927 by Drs. R. P. Forbes and F. G. Ebaugh. In general, his health had been good, but he began to show great unsteadiness in gait, and extreme suboccipital pain on bending forward. He frequently vomited on first awakening in the morning. He was referred to Dr. Harvey Cushing with a tentative diagnosis of brain tumor. There was marked restriction of both fields of vision, and great swelling, 5 D., of each optic disc.

May 16, 1927, under novocaine anesthesia, tapping of the lateral ventricles through the occipital bone showed on the right side that the fluid was under high tension, and gave great relief to his symptoms. The occipital bone was very thin. Its removal, with turning back of the dura, revealed "a tangle of veins" coursing over the right cerebellar hemisphere. On account of bleeding, the operation was suspended, remaining merely a decompression operation. Recovery was prompt and the results excellent. The papilledema decreased to 1 D. in each eye. But the vision continued to decline. To avoid the danger of total blindness, a second operation was performed on October 24, 1927, under novocaine and rectal ether. Reopening of the flaps of the dura showed a highly vascular tumor completely filling the right posterior fossa. This was removed up to the tentorium; and on November 17th the patient was discharged in excellent condition.

February 23, 1928, he was referred to the writer for observation of his eye conditions and vision. The ophthalmoscope showed the media clear; retinal reflexes normal; optic discs grayish-white, with hazy margins; and the temporal quadrants white, the retinal vessels small, especially in the left eye. Otherwise the eyes were normal. His vision was: right 0.2; left 0.02. His general health had improved, and his father thought him well in all respects.

On August 24th, vision of the right eye had slowly improved to 0.4, the left unchanged. The discs were a little less pale, the retinal vessels nearer normal. The periphery of the retina in each eye was free from lesions of any kind. It

was especially examined for evidences of retinal angiomatosis. The general contraction of the fields of vision had grown less. The greatest extent of the temporal fields on the horizontal meridian was for right eye, 50 degrees; left eye 80 degrees, and the lower nasal field of the left eye had reached about normal limits.

Central vision slowly improved. On September 8, 1931, it was right 0.4, left 0.06. Since that time the fields have remained unchanged. Meanwhile the patient has gone steadily ahead with his studies, in school and college, standing well in his classes, and graduating from the latter in 1939. His health seems sound in every way and, but for his narrowed fields of vision, he could qualify in athletics.

The impairment of vision seems to have been wholly due to the changes in the optic nerve. It has long been noticed that tumors of the cerebellum are particularly prone to cause choked disc. In reported cases the removal of the tumor has checked the process, and some recovery has followed. All our experience points to the importance of early diagnosis. The fear that, in this case, retinal angiomatosis might also develop, proved to be groundless.

Republic Building.

A SELF-SETTING CROSS CYLINDER*

JOSEPH I. PASCAL, M.A., M.D.
New York

The purpose of this device, conveniently called a self-setting cross cylinder, is to make cross-cylinder tests a little more workable and more accurate. The instrument consists essentially of a cross cylinder set in a mount having its own axis scale and provided with an automatic stop so that twirling the cross cylinder rotates it through an angle of exactly 180 degrees. It also permits rapidly changing the cross-cylinder power to suit the case at hand. The mount can be held in front of the trial frame, or preferably set in the front cell of the trial frame.

Of the six or seven applications of the cross cylinder I will refer to only two.

Fig. 1 (Pascal). A self-setting cross cylinder.

To find the presence of astigmatism, the cross cylinder has to be tried with its axes in at least two different positions, preferably in three different positions at intervals of 30 degrees. In each position it has to be twirled through an angle of exactly 180 degrees.

It is rather difficult to carry out this three-position test with an unsupported cross cylinder held in the hand. With the self-setting cross cylinder the three positions can be rapidly and accurately located and a rotation of exactly 180 degrees made in each setting.

Astigmatism is generally detected most easily with the cross cylinder when the eye is not fogged by lenses. With this device in the front cell, if the patient's answer is negative or uncertain, the spherical lens can be changed without disturbing the cross cylinder and the three-position test rapidly repeated, until astigmatism is either found or ruled out. Especially in cases where regular astigmatism is obscured by a considerable amount of irregular astigmatism will this application prove useful.

When locating the astigmatic axis, the loosely held cross cylinder is especially

* Presented before the Section on Ophthalmology, New York Academy of Medicine, February 19, 1940.

apt to be troublesome. In this test, the cross-cylinder axes must be placed exactly at 45 degrees to the test-cylinder axis and in this fixed position the cross cylinder must be twirled through exactly 180 degrees. If a change of axis is indicated and the test cylinder rotated, say, 10 degrees, the cross cylinder must be realigned to the new position of the test cylinder and similarly rigidly held and twirled through 180 degrees.

With the mounted cross cylinder this procedure is easily carried out. The cross cylinder is accurately lined up on its own axis scale where it stays fixed in position during the twirling. It is quickly rotated and set in any new position as required by a change in the test-cylinder axis. The automatic stop always assures a rotation of exactly 180 degrees.

Dr. Edward Jackson and other outstanding ophthalmologists have repeatedly referred to the cross cylinder as one of the most useful devices for subjective testing. Yet it is a fact that the cross cylinder is relatively little used. I believe this is due, in part at least, to the gap between the theoretical excellence of cross cylinder tests and the practical difficulties in applying the tests. The device here presented does not introduce any new cross-cylinder tests. It is designed primarily to bridge the gap, to some extent at least, between the theoretical precision and the practical application of these really worthwhile tests.

37 West Ninety-seventh Street.

A STREAMLINED CATARACT KNIFE

CHARLES NELSON SPRATT, M.D.
Minneapolis, Minnesota

For more than three quarters of a century the Graefe knife has been the instrument of choice with the majority of surgeons in making the cataract section. A number of years ago I felt that this instrument could be improved.

In making the section for the removal of cataract with the narrow knife, the iris may be injured by falling against its edge, due to the escape of aqueous. In many models of the instrument the point is rather blunt and more force is required in making the incision than is desirable.

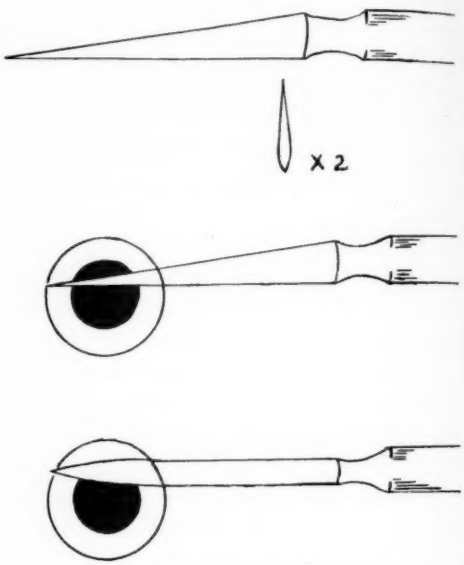

Fig. 1 (Spratt). Streamlined knife, showing cross section and straight back. The two lower figures show the difference in level of the counter puncture made by this knife as compared with that made by the Graefe knife.

The counter puncture is not directly opposite the puncture and often results in off-axis astigmatism.

The Beer knife with the wedge-shaped blade, in contrast, prevents the escape of aqueous. The straight back of the blade allows the point of the knife to make the counter puncture at the same level as the puncture. This instrument, however, is clumsy, and the point, forming an angle of 30 degrees, is too blunt for easy penetration of the cornea.

Many years ago I stopped making the incision at the limbus with the small conjunctival flap and changed to the pocket-flap operation with suture introduced before making my section. At about this time I ground the cutting edge of a Beer knife to one half its width, reducing the angle of the point from 30 to 15 degrees. The back of the knife remains in a direct line with the handle. The blade is 30 to 32 mm. long, 4.5 mm. wide, and 0.7 mm. thick. On cross section the blade is streamlined so that it effectively blocks the corneal wound.

Similar knives with a point of 15 degrees have previously been described by Jackson, Pinto, Ridley, Taylor, Ramsey, and others.

The advantages of this knife are: (1) the cutting edge being straight can be more easily sharpened; (2) the needle-like point penetrates the cornea with the slightest pressure; (3) the straight back, continuous with the handle, causes the counter puncture to be made in a horizontal plane and thus oblique astigmatism is avoided; (4) the knife being wedge shaped in both cross section and length plugs the incision of the puncture and counter puncture, thus preventing loss of aqueous and injury to the iris.

1231 Medical Arts Building.

SOCIETY PROCEEDINGS

Edited by Dr. H. Rommel Hildreth

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

February 6, 1939

Dr. Percy Fridenberg, *presiding*

Symposium on circulatory factors in renal disease

1. Physiology of the retinal circulation

Dr. David Swick pointed out that the retinal circulation is adapted to the optical function of the eye and to the intraocular pressure, the vascular pressure in all the vessels being higher than the intraocular pressure and varying according to need. The chief purpose of the control of the vascular circulation is to regulate the blood supply to the capillaries where the vital function of the blood, the metabolic interchange, takes place. In order to preserve transparency the intraocular fluid must be practically protein free, hence the retinal capillaries are less permeable to proteins than elsewhere.

2. Circulatory factors in renal disease and hypertension

Dr. William Goldring stated that renal arteriolar sclerosis results in renal ischemia, producing a pressor substance which on absorption into the blood stream sets up widespread vasoconstriction leading to hypertension. In turn this leads to diffuse as well as renal arteriolar sclerosis. This is a concept depending on animal experimentation which should be transferred to man with caution for the present.

3. Circulatory changes in the retina with special reference to glomerulo-nephritis

Dr. Henry P. Wagener stated that originally all retinal lesions were thought to be of nephritic origin. Then ophthalmologists veered to the other side and were inclined to think that all lesions were hypertensive. Now we are getting into a combination phase, where retinal lesions may be considered due to hypertension that may have its origin in the kidney. He was inclined to support the toxic theory—that this involves changes in the circulation which affect the retina. The greatest objection to this is that circulatory lesions may not be produced experimentally by the injections of toxins. The type Koyanagi produced is simply edema. Retinitis develops usually after hypertension, the latter being associated, at least at first, with generalized arteriolar contraction through the body. The cause of this is still not clear. From the prognostic standpoint acute angiospastic retinitis is the worst. The average length of life after its development is from four to six months.

Discussion. Dr. Sigmund A. Agatston said that when the cause of spasm is found the cause of hypertension will be discovered. He objected to the phrase "hypertension causes sclerosis" because whatever causes hypertension also causes sclerosis. He agrees with Dr. Wagener that in any type of retinitis there is evidence of kidney failure.

Dr. Martin Cohen stated that during the course of examination of pathologic sections of eyes from patients with malignant hypertension he found many with

intimal thickening due to hyalinization with marked encroachment on the lumen, but only few cases where there was medial thickening of the arterioles.

Dr. Percy Fridenberg said many years ago Leber described the retinal circulation as being terminal in type and said that the pulsatory phenomena were similar to pulsation in the fingertips and represented a balance between blood pressure and intraocular tension. Fritz pointed out that if increased pressure were continued long enough it would produce changes in the smaller vessels resulting in "pseudo-media" in the veins, and tortuosity of the venules. The end result is a sort of arteriolization of the veins.

Dr. David Swick said the venous pulse is probably due to the action of the left ventricle and not to the action of the right heart as R. H. Elliot thought. The left ventricle produces a wave of pulsation in the retinal vessels which is not apparent, owing to the opposed intraocular pressure. But on the disc, where the venous pressure may be lower than the intraocular pressure, a venous pulse may be seen.

Dr. Henry P. Wagener said that in the average clinical hypertension, if a biopsy of muscle arterioles is taken, the most frequent change is entirely in the media. In malignant hypertension the typical finding is intimal necrosis. The average case of retinitis also shows this on *post-mortem*.

Sidney A. Fox,
Secretary.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

March 6, 1939

Dr. Percy Fridenberg, *presiding*

Pathogenesis of chronic simple glaucoma

Dr. Herman Elwyn pointed out how all theories regarding the cause of chronic simple glaucoma have proved inadequate. There is an assumption at present that the maintenance of intraocular pressure can be explained on the basis of a balance between the osmotic pressure of the proteins in the blood and the hydrostatic pressure in the capillaries. But this does not consider the important element of regulation. Intraocular pressure being a constant, it must be regulated by effector organs which are under central control. This must be assumed even though the location of this central regulatory mechanism is not known.

The loss of stability of this mechanism is the pathogenic factor in chronic simple glaucoma, and is due to age and heredity. The regulating mechanism's loss of stability for maintaining intraocular pressure at about middle age is the age factor; constitutional inferiority in those individuals with inherited influences being the hereditary factor. The central regulation cannot be improved but efforts can be directed toward finding substances which imitate more and more the action of the messengers by which this center regulates the effector organs. We have here the same problem of treatment as in diabetes, in which improved preparations of insulin cause a more equable maintenance of the sugar level.

Discussion. Dr. Mark J. Schoenberg said the function of maintaining a normal intraocular pressure is one of several

functions in the body maintaining physiological constants for which Dr. Cannon had coined the name "homeostasis." Perhaps it might be better for Dr. Elwyn to mention a third factor in the regulation of ocular tension in addition to the central regulatory mechanism and the effector organs, and that is the sensory organ in the eye. Another important point directly related to Dr. Elwyn's conception was the influence of emotional upsets and relaxation on the variations of ocular tension in glaucoma.

Dr. Isidor Givner asked if there is any neurological condition in the brain that is associated with intraocular tension. A study of episcleral and scleral ganglion cells in glaucomatous eyes, during the past year, showed no pathological changes.

Dr. Percy Fridenberg said two generations ago tension in the eye was explained by anatomy and topography; that is, dimensions of the lens system, anterior chamber, and so forth. Schnabel stated that chronic simple glaucoma was a degenerative process in the nerve tissue, with the formation of lacunae, recession of the lamina, progressive optic-nerve atrophy, and little or no increase in tension. Then Arnold Knapp showed that this Schnabel atrophy was contributed to by calcareous changes in the vessels in the neighborhood of the chiasm and sella. Should not such direct tissue changes be considered in any theory about the cause of glaucoma?

Dr. Herman Elwyn in closing said that he referred only to chronic simple glaucoma in which there is an increase in tension without apparent pathologic change. Just as every constant in the body—such as heat, water, carbohydrate, and fat regulation—has a regulating mechanism and a center, so also must intraocular tension. And there must be a reflex arc so that the moment there is any change it is immediately equalized. The more one thinks about regulatory mechanisms the more one realizes that it cannot be otherwise.

Traumatic ocular hypertension—a preliminary report

Dr. Morris Davidson presented this primarily as a report of hypertension resulting from injuries including the lens, contusions accompanied by massive intravitreous hemorrhages, and also some eyes in which the important pathology is at the posterior pole, showing an association of retinal detachment with hypertension. In a series of 16 cases seen at the Bureau of Workmen's Compensation of New York during 1938, five were of the latter variety. The mechanism of posterior-pole lesions from contusions is all indirect. The explanation has always been difficult in terms of propagation of the force from in front alone. The insertion of the optic nerve and inferior oblique muscle are probable factors.

Discussion. Dr. Mark Schoenberg stated that some of these persons might be predisposed to glaucoma or might have had primary glaucoma before the injury.

Dr. Benjamin Esterman suggested that they may fall into the class of secondary hypertensions due to retinal hemorrhage.

Dr. Morris Davidson, in closing, stated that the type of case he was reporting was very rare and, considering the large number of eye contusions, these are probably not predisposed eyes, particularly since they are all monocular cases. The circumstances favor direct, not indirect, relationship. Three of these patients were operated on, one resulting in good preservation of vision. As for retinal hemorrhages, we know that in central-retinal-vein thrombosis there is hypertension very often.

Surgery in glaucoma with special reference to its complications

Dr. Webb W. Weeks read a paper on this subject illustrated with lantern slides. He reviewed the various procedures indicated in the different types of glaucoma and stated that failures of operative intervention were due to three main causes: failure to operate early enough, wrong operative procedure, and faulty technique and after-care.

Discussion. Dr. Algernon B. Reese said that early operation was the most important requisite for adequate treatment of glaucoma. In a recent analysis he found that over 90 percent of the cases were arrested by operation when performed early and only 27 percent when performed late. These figures were on the basis of an average follow-up of five years.

Dr. John Bailey asked Dr. Weeks if he splits the cornea in trephining. It was his impression that corneal tissue grows over the opening again if this is done. He contended that the cornea was not really split but that the loose episcleral tissue was separated from the corneal parenchyma.

Dr. Raymond E. Meek said it was his impression that in an operation for glaucoma the idea was to get well into the angle with keratome or knife. Verhoeff, in discussing Barkan's paper, made the statement that in entering Schlemm's canal the canal was destroyed. Was this good for the eye?

Dr. Webb W. Weeks, in closing, stated that he had been getting away from splitting the cornea in trephining operations because of the unnecessary trauma. He thought the cornea was cut rather than split. He agreed with Dr. Meek that if Dr. Barkan got into Schlemm's canal irreparable damage was done. He said he would be interested in seeing what pathological material Dr. Reese had at the Eye Institute following Barkan's operation.

Sidney A. Fox,
Secretary.

CHICAGO OPHTHALMOLOGICAL SOCIETY

May 8, 1939

Dr. Georgiana D. Theobald, *president*

Sympathetic ophthalmia treated with sulfanilamide*

Dr. Richard C. Gamble presented A. H., a boy aged 11 years, who had suffered a small penetrating injury through the limbus of his right eye by a piece of wire on November 5, 1938. There was a slight prolapse of the iris but practically no inflammatory reaction, and it did not seem advisable to excise the prolapse. Vision was 20/20 in each eye. The prolapse soon became covered with epithelium. Five weeks later several precipitates were seen on the inner surface of the right eye. There was a little ciliary injection in the left eye and a posterior synechia was forming. Vision was still 20/20 in each eye. Both pupils were dilated with atropin. Sulfanilamide therapy, gr. 40 daily, was started. After a week of this treatment the temperature suddenly rose to 104°F. one day and to 106 degrees the next. At this time there were one precipitate in the right eye and four in the left eye. Sulfanilamide was discontinued for four days, then, as the temperature was normal, was administered again; however, after two doses the temperature rose to 103.8 degrees, there was emesis, and the medication was discontinued. Sodium salicylate was given for a week, but the precipitates appeared

*A further concluding report on this case will be published in this Journal.

again. It was therefore omitted, and intramuscular injections of proteolac were given, but the precipitates increased greatly in number. Sulfapyradine was administered, 40 gr. daily, and in four weeks the precipitates had completely disappeared. Sulfapyradine was then discontinued; in a week, however, the precipitates had returned, and so it was again ordered. Several injections of proteolac were given, and once more the precipitates increased greatly, so that no more proteolac was given. The precipitates have slowly become fewer and smaller but have not completely disappeared.

Two weeks ago the use of sulfapyradine was discontinued and sulfanilamide again given, this time in doses of 60 grains daily. There has been no fever, and the precipitates are diminishing. The retinal veins are a little tortuous, there is no thickening of the iris, and vision (about five months after the onset of the sympathetic opthalmia) is R. 20/20, L. 20/20. While sulfanilamide was given the blood concentration was maintained at about 5.5 mg. percent. While sulfapyradine was used the blood concentration was kept at about 1.5 mg. percent. The blood count and hemoglobin have not been depressed enough to cause concern. This is probably a mild type of sympathetic ophthalmia, nevertheless the action of both sulfanilamide and sulfapyradine seems to be definitely beneficial.

Nevus flammeus with glaucoma: right eye

Dr. R. O. Riser presented W. F., a baby boy, aged seven months, who was first seen at Children's Memorial Hospital when he was four weeks old because of a large dark-red birthmark covering the right side of the face from the posterior fontanelle to the neck, and extending back to the right ear, stopping sharply at the facial midline.

General medical examination revealed no pathology except for further birthmarks found over the left buttock and on the right side of the back. X rays of the skull were negative.

When the baby was four months old, a note was made that the birthmarks were not so red as on first description. When five months old, the birthmarks were not changed, but the pediatrician thought that the right eye was more prominent.

On April 14, 1939, the facial findings were as noted above. The left eye was essentially normal, the cornea measuring 10 mm. and the iris light blue in color. The cornea of the right eye measured 11 mm. and the iris was a muddy brown.

The fundus of the left eye was negative. The disc of the right eye was vertically oval. There was a deep cupping of this disc which did not extend to the margin. The disc was slightly muddy in color but not atrophic. No choroidal nevus was seen. Ophthalmoscopic examination did not disturb the baby as much in the examination of the right eye as when the left eye was examined. There was a weaker pupillary response on the right side. Tension to fingers was higher for the right eye, but both seemed to be within normal limits. Tonometric readings have not yet been made. An Elliot trephining operation is contemplated.

Interstitial keratitis

Dr. Philip A. Halper said that B. G., a girl aged five years, had been treated at Michael Reese Hospital for congenital syphilis from May, 1929, to June, 1932, at which time she was transferred to the Eye Clinic because of pain in the eyes, photophobia, and lacrimation.

This was a typical picture of interstitial keratitis. There was no history of trauma. She was treated for syphilis until 1934 with very poor results. Mantoux test 1:1,000 was strongly positive, and tuber-

culin injections were given. These were continued from March, 1934, to May, 1935, with an excellent response: the symptoms promptly disappeared and the opacification of the corneae lessened. The patient now has fairly clear corneae, and her vision when last tested (in 1935) was 20/100 in each eye.

Bilateral spastic entropion and mild conjunctivitis

Dr. Philip A. Halper presented R. R., a woman aged 62 years, first seen on June 30, 1937, with bilateral spastic entropion and mild conjunctivitis. An operation had been performed on both lower lids for the same condition on April 2, 1937—an excision of the skin 3 mm. wide and a resection of the orbicularis muscle along the entire margin of both lower lids. She came to the clinic because of spastic entropion. Novocaine was injected in the lid to relax the spasm and she was referred to the Psychiatric Department. In March, 1938, novocaine and alcohol were injected into the lower lid. This was repeated two weeks later. The response was temporary, and radical cauterizations of the left lower lid were made in June, 1938, with excellent result. By the time the left lower lid was healed, the spasm of the right lids had also disappeared.

Gonorrheal ophthalmia

Dr. Philip A. Halper presented an infant girl, M. G., born July 17, 1937, with a birth weight of 2,065 grams. The calculated fetal age by history was 30 weeks. She was immediately hospitalized because of prematurity. On July 22d a thick purulent discharge was noted in the left eye. The smear was positive for gonococcus, and the eye had the clinical appearance of gonorrheal ophthalmia.

Treatment was immediately started with irrigations every two hours of saline solution followed by sulfanilamide (0.8 percent) irrigation. On July 23d 1 c.c. of whole boiled milk was given intramuscularly and the irrigations were continued. On July 24th and 25th 0.5 c.c. of prontosil was given hypodermically. The discharge from the eye became less and the smear negative. Irrigations were discontinued on July 26th. One-percent mercurochrome was used three times daily.

On July 28th the patient was discharged as cured.

Retinitis circinata

Dr. David Holden presented E. F., a woman aged 58 years, who had come to him on March 3, 1939, complaining of poor near vision. She had had diabetes for the past 20 years. Her blood pressure was 220/70. Her urine was sugar-free and she had not used insulin for four months.

Eye findings: Uncorrected vision was R.E. 20/50, L.E. 20/50. With correction vision improved to 20/32. Lenses of both eyes showed a few vague peripheral spokes. Both fundi, especially the right, presented many yellowish-white, small, rounded exudates, which by their confluence formed ringlike formations; some of these rings were complete. These exudates were situated in the outer retinal layers, as evidenced by the retinal blood vessels stretching across. The retina within the ringlike spaces had a yellowish tinge and within these areas were found many small, fresh and old hemorrhages. The retinal blood vessels showed sclerotic changes. Some of these were accompanied by yellowish-white streaks, and there was nicking of the veins by the arteries.

Panophthalmitis following removal of a corneal foreign body

Dr. Max Herzog showed a 32-year-old man who, on December 15, 1938, had

been struck in the right eye by a foreign body. The latter was removed four days later and atropine-bichloride ointment applied. On December 20th the eye was markedly inflamed and a large and deep infiltrate occupied two thirds of the cornea. The ulcer was cauterized with trichloracetic acid, and the patient was hospitalized. Clinical examination including various laboratory tests was entirely negative for pathology. The treatment consisted in bed rest, infra-red light, atropine, and daily proteolac injections. The ulcer spread rapidly. A delimiting keratotomy did not check it. Chemosis, proptosis, and swelling of the right side of the face developed. Ocular movements were restricted. Smears from the conjunctival secretion, from the margin of the ulcer, and a culture showed no bacteria.

Enucleation was considered inadvisable because of the danger of meningitis.

After about 10 days the inflammation gradually receded and a total corneal staphyloma developed. The eyeball was enucleated on January 9, 1939.

Disciform degeneration of the macula

Dr. Max Herzog showed a 60-year-old white man, who, in June, 1938, came to the clinic because of poor vision in the left eye.

The vision with correction was R.E. 20/25, L.E. 3/200. There was a small star-shaped pigmentation in the macular region of the right eye; that of the left eye showed a brownish discoloration and numerous small and medium-sized hemorrhages. A few circinatalike changes surrounded this lesion. Two months later the left eyeground presented the typical picture of Kuhnt-Junius disease.

At this time the left eyeground shows a different picture; numerous newly-formed blood vessels are seen.

Retinal detachment in primary glaucoma

Dr. Harry S. Gradle and Dr. Daniel Snydacker presented a paper on this subject which was published in this Journal (January, 1940).

Discussion. Dr. Louis Bothman said that at the University Clinic a patient had been seen with a detachment of the retina in a glaucomatous eye similar to those reported by Dr. Snydacker. The patient was 38 years of age when first seen in October, 1927. The vision R.E. was perception of light, L.E. 6/10. The left visual field was normal. The pupil of the right eye was 4 mm. in size, of the left 2 mm. Schiötz tonometer reading for the right eye was 48 mm. Hg; for the left 22 mm. The patient had been under antisyphilitic treatment for four years, and two children were being treated for interstitial keratitis. The disc of the right eye was greenish white in color and completely cupped; that of the left eye was normal. Pilocarpine 2 percent was administered for four days, the tension being R.E. 18 mm., L.E. 24 mm.

The tension in the left eye became elevated and a trephining operation was performed on June 6, 1928, which closed; it was repeated in September, 1934, with a good result. On September 15, 1935, a retinal detachment in the lower third of the fundus occurred in the blind, unoperated-on right, glaucomatous eye. No tear was found in the retina, and transillumination was good. The tension was 11 mm. Hg; it remained normal when the pupil was dilated to 6 mm. with homatropine. On September 23, 1935, the lower half of the retina was detached. When seen in April, 1939, there was no change in the detachment and the tension was still low without medication. It was interesting to note that, with two possible causes for complicated cataract—glaucoma, followed by detachment of the retina

—the lens was still clear and the fundus easily visualized. The left eye, without medication, has vision of 10/10, tension is 22 mm., and there is a good filtering bleb.

Dr. Philip A. Halper mentioned a patient, a man aged 52 years, who was first seen in May, 1932; he had bilateral myopia. Corrected vision was R.E. 20/50; L.E. 20/30. There was a history of failing vision of the right eye for several months. There was no pain. Tension, R.E. was 48 mm. Hg, L.E. 33 mm. The right eye showed pigment dust on the posterior surface of the cornea, an atrophied iris, and third-degree cupping of the nerve head. Only central vision was present. The left eye showed pigment dust on the posterior surface of the cornea, the iris was mildly atrophic, and the nerve head had a large physiologic excavation but no cupping. Form field had a concentric contraction of about 10 degrees. The blind spot was normal. With miotics the tension remained around 40 mm. Hg in the right eye and fluctuated between 20 mm. and 25 mm. in the left eye. A Lagrange filtration operation was performed on the right eye on May 25, 1932. Tension remained between 18 mm. and 22 mm. until July, 1937. Vision had dropped to 20/200.

On July 15, 1937, the patient suddenly lost the vision in the right eye, and, when seen three days later, the eyeball was very soft, and the retina was detached in the upper half. In spite of bed rest for three weeks the detachment spread until it became total. An operation performed on August 11, 1937, was unsuccessful. The left eye has maintained 20/30 vision, normal tension, and full fields up to the present time.

Dr. Harry Gradle said that this report covered cases of a condition which seemed rather unusual in the literature dealing with retinal detachment. As Dr. Snydacker had shown, comparatively few cases of detachment develop subsequent to hypertension. Reasoning *a priori*, one would say hypertension should militate against a detachment. On the basis of the small number of cases reported, apparently the prognosis is unfavorable. Judging from the few other reports in the literature and that reported by Dr. Halper, apparently surgery in retinal detachment occurring during hypertension did not offer the same success as in an uncomplicated eye. So little is known of retinal detachment and hypertension that a theoretical discussion would be unprofitable.

Attempts to produce experimental tumors of the eyeball

Dr. Arthur Weil (by invitation) and Dr. Leo Mayer read a paper on this subject.

Discussion. Dr. Georgiana Theobald believed that Dr. Weil had done a remarkable piece of work and should not be discouraged because he did not produce cancer in the eye. In the first place, he probably used adult rats, whereas it is known that retinal tumors usually occur in children. Tumors of the unpigmented epithelium of the ciliary body occur in adults, and his injections did produce a hyperplasia of the unpigmented epithelium. The tissues of the uveal tract were not touched in Dr. Weil's experiments. In adults, tumors occur from ectodermal structures in the uveal tract. He might have more profitable results if the cancerogenic substances were injected into the uveal tract.

Dr. Leo L. Mayer emphasized a few of the similarities of this experimental condition with some human conditions. It gave an insight into what might be expected with future work along this line in producing in animals more nearly some of the tumorous conditions found in the

human eye. When Dr. Weil published his first work on tumors of the brain, the thought came to mind that inasmuch as the eye was very easily watched, the tumorous character could be noted and the various layers could be readily studied, therefore this work was carried out.

The reason for using white rats was important. Through a technique of his own, Dr. Weil was able to keep the rats alive for a long period of time, and, as indicated by prior records, the difficulty in producing cancer tissue and malignant disease had been the fact that the animals had not lived long enough to show serious reactions. The span of life of the white rat kept under ideal conditions enabled study for a longer time, which is not possible with larger animals because of the expense and the need for care.

The picture of Coats's disease and that produced here seem to be very similar. The interesting phase of pseudo-glioma shown was not due to trauma itself, but probably due to irritating substances injected into the eyeball. Evidences of cholesterol, fat disorders, asteroid bodies, and so forth, were seen in the eye, as well as evidence of fat metabolism which had gone astray. It is interesting to note that by the use of fatty substances irritation is caused in the retinal tissue.

The Leland refractor: a method for refraction under binocular conditions

Dr. Stephen van Wien discussed this instrument designed by Mr. George H. Leland an electrical engineer. By the use of polarized light it is possible to conduct refraction tests under binocular conditions. Not only is there a very sensitive test for the axis and amount of astigmatism, but also a balancing of the spherical correction as well as adjustment of the axes in binocular vision. The instrument indicates, in cases of muscular imbalance, the spherical changes required or, if prisms are indicated, the proper amount.

Clinical examinations have been carried out in the Eye Department at Northwestern University Medical School, and in the Out-Patient Department of Mt. Sinai Hospital.

Discussion. Dr. James P. Lebensohn said that the Leland refractor with its distinctive novel features, is constructed with remarkable ingenuity, and represents definite progress in the armamentarium of the refractionist. Javal recognized the value of binocular fixation, and incorporated the stereoscopic principle in his optometer. The advent of Polaroid permits for the first time the successful use of binocular fixation in refraction at six meters' distance. Monochromatic light enhances definition and secures a constant accommodative status, as the eye cannot then shift its attention to different chromatic zones. Red is the most suitable color to use. That red stimulates accommodation is not of importance, as the preliminary test results in slightly greater correction on the plus side, as if the chart were at four meters' distance instead of at six. This may be corrected if necessary in the binocular visual-acuity test. A precise cycloplegia refraction at six meters must represent one-sixth diopter of plus over-correction. As the illumination usually used in retinoscopy has an orange-red component, the retinoscopic findings tend to a similar over-correction. The test with the Leland refractor under cycloplegia agrees with other methods, as all have a similar variation. It is possible that in the manifest refraction with binocular fixation the patient selects the most desirable refraction. It would seem more scientific, however, especially in younger persons, to have available also the cycloplegic findings and the complete data of muscle-balance tests.

Dr. Sanford Gifford observed that the fact that Mr. Leland submitted the instrument to these tests before putting it into production should be appreciated. Difficult patients are known to everyone; they go from office to office and are always examined by the same methods, with comparable results. It might be that this instrument would help in difficult cases. It is not proposed as a substitute for previous methods but as an additional refinement after cycloplegia and retinoscopy.

When both eyes are used together, it is possible that they undergo a slight torsional deviation, and the refraction selected might not be satisfactory for both eyes under such conditions. It might be that cases of cyclophoria are more common than has been thought.

Mr. George H. Leland remarked that having had a great deal of difficulty with his own eyes in the past, he tried to determine whether or not some of the difficulties experienced by doctors in examining eyes might be overcome. He had found that a high plus spherical correction was usually prescribed, as a result of which he could not tolerate the glasses for more than a few days. Red light was found more satisfactory in experimental work, as it seemed most free from stimulus to accommodate. Therefore a method was worked out so that the two eyes could be kept in binocular vision while the individual eye was being tested.

The work was carried out with the cooperation of the ophthalmologists, and nearly all patients who had received prescriptions by the new method were satisfied. The instrument provides a target which does not stimulate the eyes to adjust accommodation to overcome their own errors, and also provides a means to maintain the eyes in a state of binocular fixation during correction of the individual eye.

He appreciated the coöperation given by Northwestern University Medical School. If the method has merit, it will be offered to the public; if not, it should be shelved.

Dr. Elias Selinger said that after having Dr. van Wien test his eyes with this method, he felt that the periods between light and dark were a trifle longer than they needed to be. Speeding up the two periods would be of value as it would shorten the time of examination and offer the patient a better contrast. It might be difficult for a patient to note the difference in one-eighth diopters, and if the test were begun with one-fourth diopter, it might be easier to note changes in the definition of the red lines.

Dr. Stephen van Wien (closing) thanked Dr. Gifford and Mr. Leland for their comments. He agreed with Dr. Selinger that to make changes in one-quarter diopter steps would be an improvement. If two images appeared at about the same size, the patient might be able to decide for the one-eighth step in between.

Robert von der Heydt.

COLORADO OPHTHALMOLOGICAL SOCIETY

May 27, 1939

Dr. Melville Black, *presiding*

Phylyctenular keratitis

Dr. Harvey S. Rush reported the case of L. R. W., aged eight years, who was first seen on December 14, 1938. At that time a phlyctenule was observed on the temporal portion of the limbus of the right eye. This phlyctenule disappeared after two weeks' treatment with mercuric oxide. The condition recurred on March 8, 1939, at the same location, assuming a more serious appearance with corneal ul-

ceration. There was a marked purulent nasal discharge and tonsillar infection. No other general physical disturbance was found except that the child was underweight. The nasal discharge stopped while she was under treatment. Mercuric oxide, hot applications, and atropine were used in the eye, which, however, became gradually worse, the corneal involvement more extensive. On May 16, 1939, the tonsils and adenoids were removed. Rapid ocular improvement followed the operation. At present only slight peripheral scarring is seen.

Discussion. Dr. William Crisp said focal infection may be a factor in phlyctenular diseases. Tonsillectomy in such cases may be important not only to remove the focal infection but also to improve the general health of the child.

Dr. Guy Hopkins stated that he questions the importance of focal infection in such cases but thinks that the removal of diseased tonsils is definitely advisable.

Dr. Melville Black stated that careful search should be made for childhood tuberculosis in protracted cases of phlyctenular disease.

Dr. James M. Lamme stated that he saw numerous cases of phlyctenular disease among poor Spanish-American children. He regards the disease as secondary to malnutrition and poor hygiene. In such cases he prescribes tincture of iron chloride and high-vitamin diet including liver and onions.

Occlusion of central retinal artery

Dr. James M. Lamme presented the case of Mr. J. M. C., aged 78 years. During the past few months this man had experienced several transient periods of blurring of the vision of the left eye. On May 25, 1939, at 4:30 p.m. the vision of the left eye failed suddenly and completely and did not return. The left eye is entirely blind and there is a consensual but no direct reaction to light. The media of the left eye are clear. The details of the disc are indistinct. Both arteries and veins are nearly empty but tortuous. The veins are approximately the same size as the arteries. There is some fragmentation of the blood column. The fundus has a yellowish appearance with a yellow haze around the macula. The fovea is a vivid red.

Discussion. Dr. Melville Black stated that paracentesis, amyl nitrite, and massage might be used in such cases, but that this case is hopeless on account of the advanced age of the patient and general arteriosclerosis.

Questionable retinal separation

Dr. Guy Hopkins presented the case of C. G., aged 55 years, who was first seen on April 17, 1939, with a history of blurred vision in the left eye of two months' duration. This man had previously been seen by another oculist who advised surgery for a retinal separation and had prescribed pupil glasses. The vision of the left eye was 20/20 and there was an indefinite field defect. There were marked vascular changes with some pigmentation and old hemorrhages. No separation was detected.

Early chorioretinitis

Dr. Oliver C. Wise presented the case of I. W., a schoolgirl, aged 11 years, who had consulted him because of poor vision and headaches. The right eye was myopic. There was a large opacity in the vitreous of the right eye and an indefinite edema of the macular area. Vision with correction was 20/50. The left eye was practically blind because of congenital posterior cortical cataract. Detailed physical examination and laboratory determinations failed to demonstrate any systemic disease. The case was presented as active chorioretinitis of unknown etiology.

Emphysema of lids

Dr. Oran C. Dail presented the case of A. M., who had developed extensive swelling of the right eyelids immediately after sneezing. The man had boxed earlier in the day but did not remember being struck in the face. Both lids were greatly swollen. Crepitus could be elicited on palpation of the soft tissues. Diplopia was noticed when the eyelids were held open. Apparently the patient had received a minor nasal fracture from boxing and then emphysema had followed the sneezing.

Discussion. Dr. James Shields mentioned several similar cases that he had treated and recommended that a tight bandage be applied.

Abducens paresis

Dr. Guy Hopkins reported the case of L. K., aged 19 years, who had first consulted him on May 4, 1939, complaining of diplopia of two weeks' duration. The boy had struck his head slightly two weeks before. Diplopia field studies demonstrated a weakness of the right lateral rectus. X-ray studies of the skull were negative for fracture or abnormal calcification. The Mantoux test was positive and there was some hilus haziness in the chest X-ray film. There was marked cervical adenopathy. All reflexes were hyperactive with the exception of the abdominals and cremasterics, which were absent. The relationship of the minor head injury to the diplopia was very indefinite.

Discussion. Dr. Melville Black stated that he thought the head injury was probably the cause of the diplopia but that multiple sclerosis or other neurological disease must be considered.

Dr. William Crisp suggested prescribing a prism for the hyperphoria present to see if the diplopia might be made more tolerable.

Dr. James Rigg stated that large doses of vitamin B might speed recovery.

Conjunctival lesion

Dr. James Rigg reported on the case of a 35-year-old woman whom he had examined because of inflammation of the conjunctiva of the left eye. There was an elevated red area of the bulbar conjunctiva nasal to the cornea. In the center of this area there was a cup-shaped depression from which pus exuded. The entire conjunctiva was freely movable. Recovery followed excision of the area. The excised tissue was examined for a foreign body but none found. An excellent photograph of the lesion was exhibited.

John C. Long,
Recorder.

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MEDICAL PREPAREDNESS FOR WAR

Since the opening of hostilities in Europe the medical profession has been speculating on the part it is scheduled to play in the preparedness program in this country. It has become increasingly obvious that the United States must be ready for any eventuality which may draw it into the European maelstrom. The answer to the question of the manner of our participation may be clarified by consideration of some of the pertinent actions in the Army and Navy medical services in the past 24 years.

During the administration of President Wilson, in 1916, the National Research Council was formed, its purpose being the coördination of nongovernmental technical and scientific resources of the country with the military and naval organizations within the Government in the interests of security and efficiency in handling the possible situation that might arise in case of war. An Executive Order was issued by President Wilson in 1918, making permanent the National Research Council, since this body had proved its value in wartime so clearly that it was obvious that its continuance in peacetime might be very valuable to the Government. In 1919 the Council was reorganized to provide for the coöperation of men engaged in research throughout the country, by

inviting the national technical and scientific societies of the United States to designate representatives for membership in the Council. It is a quasi-governmental organization and its services are constantly at government disposal.

On June 15, 1940, a meeting of the Committee on Surgery of the National Research Council, together with invited guests, met in the National Academy-Research Council Building of Washington, D.C., to consider the matter of preparedness in so far as it concerns surgery and the surgical specialties. Dr. Evarts A. Graham was appointed chairman of a National Defense Surgical Advisory Committee, established by the National Research Council in collaboration with the Surgeons General of the Army and Navy. Dr. Irvin Abell, a member of this committee, was appointed chairman of a Committee on Medical Preparedness authorized by the American Medical Association at the 1940 session of the American Medical Association House of Delegates in New York. This committee of 10 members of the house and 5 officers of the association as *ex officio* members was formed to coöperate with the Government in prevention of disease and care of the sick in both civil and military aspects.

The American Medical Association committee has sent to every licensed doctor of medicine in the United States and its territories a questionnaire to be filled in with full information regarding the qualifications of each physician with special reference to his availability to the nation in case of war. By the time this issue is published the reports will long since have reached their destinations.

Dr. Frederick A. Coller was appointed chairman of a sub-committee of the National Defense Surgical Advisory Committee to coördinate the surgical specialties. The following chairmen were appointed: Dr. Howard C. Naffziger, neurosurgery; Dr. Evarts A. Graham, thoracic surgery; Dr. Robert H. Ivy, maxillofacial surgery; Dr. Herman Kretschmer, urology; Dr. Allen Whipple, wound healing; and Dr. Arthur C. Christie, radiology.

To Doctors Graham and Coller was left the appointment of representatives from the Ophthalmological and Otolaryngological Associations. Dr. Harry S. Gradle was appointed chairman for Ophthalmology and Dr. Harris Mosher for Otolaryngology. Dr. Gradle later appointed Drs. W. L. Benedict, S. R. Gifford, Peter Kronfeld, and Lawrence T. Post on the Committee for Ophthalmology.

The specific preliminary duties of the Committee on Ophthalmology as outlined by Dr. Coller were as follows: The preparation of a Syllabus outlining the accepted methods of treatment of injuries of the eye for the general medical officer; to express an opinion as to whether or not there were enough trained ophthalmologists in the United States to meet a national emergency; and, in case the number was regarded as insufficient, to prepare an outline for a rapid course that could be given by the existing medical schools adequate to meet the deficiency.

The Committee for Ophthalmology met in Chicago on July 16th. Chapters for the proposed Syllabus were outlined and assigned to members of the committee, who are now working on this assignment. In the judgment of the committee there was an adequate number of ophthalmologists to meet an emergency. This was colored, perhaps, by the opinion that hastily trained ophthalmologists would be worse than none.

It must be evident to everyone that preparedness is as indispensable in medicine as it is in the military branches. It is unnecessary to urge every ophthalmologist to coöperate with the Govern-

ment and supply as promptly and fully as possible the desired information. It is equally unnecessary to comment that, earnestly as we may hope that we shall not find it necessary to participate in another world struggle, it would be worse than folly not to be ready for every eventuality.

Lawrence T. Post.

TEACHING OF REFRACTION

Probably no branch of medical work has been less systematically taught than refraction. Many beginners in refraction have had to depend upon a very inadequate amount of knowledge as to basic principles, supplemented by relatively unguided floundering through a mass of the kind of human material found in a crowded clinic. They have begun and continued in an unfortunate position, corresponding to that of the individual who attempts to understand disease and its treatment without a thorough knowledge of pathology.

Systematic attempts to develop the proper combination of didactic and practical training have become more numerous within recent years, but there is still room for much improvement. The haphazard approach remains far too general.

The problem is rendered more complex by the fact that those upon whom is placed the responsibility of instructing beginners have themselves absorbed widely varying views as to both principle and technique. General agreement as to all the necessary details can hardly be expected, because the practice of refraction, while based upon mathematical concepts, is affected by many variable elements in the patient as well as in the physician.

To acquire satisfactory training in refraction, the beginner needs experience with a large number of cases, but with this he must combine thorough instruction as well as a capacity for painstaking attention to details which is not always possessed by the would-be ophthalmologist. It must be confessed that in many of our eye clinics only one of these requirements is satisfied; namely, the opportunity to work on many patients. The necessity for rushing through a great volume of material, with an entirely inadequate understanding of the subject, has a destructive rather than a constructive effect. If the preliminary training consists largely in watching someone else whose approach to this important branch of medicine has been equally unsystematic, the result is easy to imagine.

Before the beginner undertakes actual measurements of patients' eyes, he ought to possess a substantial knowledge of physiologic optics as applied to human refraction, with a clear understanding of the action of lenses, spherical and cylindrical, in their relation to prisms. He should understand the meaning of regular and irregular astigmatism, the concepts involved in the interval of Sturm, what takes place in accommodation (whether applied to distant or to near vision), inequality of focus in different parts of the same pupil, and so-called spasm of accommodation or latent accommodation. He should also understand the influence of position and angling of the spectacle lens in relation to the line of vision, and the need for accuracy in frame adjustment and in the placing of the astigmatic axis within the frame. He should acquire practical experience in tracing the causes of complaints by patients after prescriptions have been filled. He should learn to be tolerant of the complaints made by clinic patients, because he will certainly have to face such complaints in his own practice. In his early clinical experience he should appreciate that many such complaints are due to the novelty of the correction, others to incor-

rect habits in the use of the eyes, and others to unreliable results in the examination, such as the physician must revise without necessarily feeling that he was himself responsible for the misunderstanding. However careful his work, he must be prepared to find a few patients whom he is entirely unable to satisfy.

As to the exact technique of refraction work, and also as to the principles of prescribing, there is some room for differences of opinion. But it would seem reasonable to ask that every refractionist should know how to place every eye as nearly as possible in a condition of emmetropia, even though his prescription will depart from such findings. If he does not know how to produce artificial emmetropia, how can he adequately criticize his own methods of testing and prescribing?

An essential lesson is that no one simple line of technique will cover all cases equally well. In difficult, variable, and contradictory cases it is frequently necessary to shift from one technique to another, comparing results and perhaps selecting those which seem most reliable.

In testing for astigmatism, Friedman (Archives of Ophthalmology, 1940, volume 23, page 1175) apparently relies chiefly upon the retinoscopic findings as checked by holding simple cylinders before the patient's eyes. He believes "the general use of astigmatic charts to consume time and energy disproportionate to the results," and argues "that equally and more consistently accurate results can be obtained without them." He is also skeptical as to the benefits to be derived from use of the cross-cylinder tests.

Friedman expresses the opinion "that the simple procedure of temporarily overcorrecting the cylinder in the trial frame by 0.5 to 1.00 D. and then rotating it a few degrees to either side of the tentative axis is far less complicated and optically accomplishes exactly what the Jackson crossed cylinder does. Much maneuvering and considerable time are thereby saved." Friedman's view in this regard is oddly at variance with that of a great many earnest workers in all parts of this country and abroad, who, once having thoroughly familiarized themselves with the behavior of the axis test with the cross cylinder, express themselves with remarkable spontaneity and unanimity as finding it "indispensable." (Compare such expression by American workers with the rather belated but wholehearted adoption of the cross-cylinder axis technique by so thoughtful a foreign colleague as Lindner. See editorial, American Journal of Ophthalmology, 1940, volume 23, page 208.)

In such institutions and individual practices as are chiefly interested in abundance of opportunity for surgery, the painstaking effort universally demanded in the performance of faithful refractive work receives but little sympathy, as approximations are the rule. But such approximations can be obtained by the patient from many optometrists or refracting opticians. If the medical refractionist is to maintain his superior standing with the public he must do something better, more expert, more final than this. He cannot reach or keep such superior standing by tolerating primitive and uncritical methods.

The old tests which Friedman favors, such as holding up simple plus and minus cylinders to check cylinder strength, and the turning of a cylindrical overcorrection to one side or the other in the frame, will often serve for broad estimation of amount, and for approximate or even exact estimation of the axis when the error is a large one. But our most difficult cases are those in which small errors play an important part for the production of eyestrain.

Exaggerated dependence upon the retinoscope, on the other hand, ignores the wide variations in cylindrical error quite commonly found in different parts of the same pupil.

Many earnest and thorough workers will differ from Friedman as to the comparative value of the so-called manifest and the postcycloplegic test. Perhaps this is partly a matter of geography. In a city like New York it may be possible to bring the patient back at a sufficiently long interval after the cycloplegic test. In other parts of the country it is frequently a matter of much inconvenience to do this, because the patient lives so far away. A really postcycloplegic test cannot be made much less than three days after the cycloplegic test, because some relaxation still remaining from the cycloplegia may interfere with discovering how far so-called latent accommodation has again become active.

The manifest test, if given more time than the mere fifteen-minute limit regarded as adequate by Friedman, often gives analogous and equally valuable information. A painstaking preliminary test actually gives much more reliable information than the postcycloplegic test as practiced by many of its advocates. Thorough use of the binocular method of testing to which Friedman approvingly refers will often produce acceptance of as much plus sphere as does cycloplegia, and a good deal more than is indicated by hasty postcycloplegic tests.

W. H. Crisp.

LEPROSY OF THE EYE

The older literature of leprosy shows its importance in tropical countries for 3,000 years. The discovery of the lepra bacillus has been followed by its practical elimination as a serious health problem, in many parts of the world. But the infected patient may carry it to any part of the world, with little chance for its recognition. It is a potential cause of blindness, and the ophthalmologist needs to know something about it.

Where it is still an important disease, the eye manifestations are among the most important. In the book of Barros (noticed elsewhere, p. 1060) it is mentioned that the bacillus may be found in smears, taken from the conjunctival sac, where there is no other manifestation of its presence. The close resemblance of this bacillus to the tubercle bacillus makes it easy to confuse leprosy with tuberculosis. Barros mentions finding the bacillus in smears taken from the conjunctival sac, when there were no lesions of leprosy noticeable about the eyes. Leprosy resembles tuberculosis in that one lesion may recover entirely, while another lesion may still be active. Unlike tuberculosis, the lesions of leprosy are especially likely to affect the skin, the eyelids, the conjunctiva, the cornea, and iris; and may extend from the superficial tissues to the deeper tissues. The choroid may be affected by such extension from the iris. The scars of skin lesions of leprosy may resemble the scars following trauma, or other skin lesions. In countries where leprosy is not prevalent, its lesions may easily be ascribed to other causes. This is as true of those about the eyes as in any other part of the body. Accurate diagnosis is needed and expected in ophthalmology as much as in general surgery or internal medicine.

Those who are familiar with the subject believe there are about 1,000 lepers in the United States, and that a very large proportion of them ultimately go blind. Prendergast reported, to the Section on Ophthalmology of the American Medical Association in 1939, his observations on ocular leprosy at the National Lepro-

sarium at Carville, Louisiana. Among 350 patients examined, only 33 had normal eyes. At Hawaii it is believed that, if the patient lives long enough, the eyes are always involved. The eyes, the lids, and the skin of neighboring parts usually give the first evidence of the disease. Many of the lepers in this country have acquired the disease elsewhere; but it is almost impossible to determine just when or where. It is of especial importance that the ophthalmologist should have in mind the manifestations of leprosy, so well described by Prendergast; and that he should be ready to make a tentative diagnosis, even if only by exclusion of the more common causes of similar symptoms. The book of Barros and the paper of Prendergast are good reminders of the fact that our specialty is still a branch of general medicine.

Edward Jackson.

BOOK NOTICES

MODERN TRENDS IN OPHTHALMOLOGY. Edited by Frederick Ridley and Arnold Sorsby. Clothbound, 699 pages, 271 illustrations and 8 colored plates. Published in London by Butterworth & Co., 1940. Price 30/–

This is a new book designed to indicate emergent tendencies and formative influences in ophthalmology. It is not a textbook, but rather a series of monographs systematizing the information that is coming from the clinics, laboratories, and periodical literature of the world. The general planning of the book is unusual and the material is of wide scope.

Part I—Ophthalmology in relation to general medicine. There are sections on allergy, immunity, tuberculosis, virus diseases, and ophthalmic conditions in tropical and subtropical regions. The relationship between psychological factors and eye conditions is written by Millias Culpin, a medical psychologist. The discussion of squint from the psychological angle and the grouping of squint into "imitative," "jealousy," and "fear or shock" cases with the recommendation of psychological treatment is a little disconcerting on comparison with the usual textbook presentation of strabismus.

The demyelinating diseases of the nervous system are discussed by W. Russell Brain, and a useful classification of the encephalomyelitic affections is presented.

J. S. Friedenwald presents the modern aspects of general vascular disease and the associated retinal and choroidal changes. The clinical interpretation of the ophthalmoscopic picture is of valuable prognostic significance.

The relation of heredity to albinism, nystagmus, color blindness, turricephaly, cataract, and corneal dystrophies is established. Suggestions for future investigations along these lines are listed. Fortunately, a glossary of technical terms of inheritance is contained in this section. The following hereditary syndromes with ocular manifestations are presented by Sorsby: Oxycephaly; acrocephalosyndactylia; fragile bones, otosclerosis, and blue sclerotics; apical dystrophy of the hands and feet; macular coloboma; and the Laurence-Moon-Biedl syndrome of obesity, hypogenitalism, mental deficiency, polydactyly, and retinal pigmentary degeneration. The better known syndromes of Nieman-Pick, Tay-Sachs, and Wilson's hepato-lenticular degeneration are included.

Part II—Diagnostic procedures. The sections on clinical perimetry by Traquair, angioscotometry by Magitot, and the diagnosis of the preglaucomatous state by H. S. Gradle are excellent but difficult to abstract. Arthur J. Bedell discusses color photography; the most satisfactory tech-

nical procedures are given and the value of moving pictures and serial fundus photographs is emphasized.

Part III deals with refraction and binocular vision. In this section the discussion of the problem of myopia by Sorsby is most interesting because the approach to the problem has been shifted from the mechanistic—that is, axial elongation of the eye—to the biological approach, which regards myopia as a physiological variation on a curve of frequency that can be constructed around a mean. A series of cases of myopic and hypermetropic children followed up over a number of years revealed that 66 percent of the hypermetropic remained stationary, while 35 percent of the myopic behaved similarly. The biological approach to the problem of myopia offers a method of study rather than the solution of the problem.

Part IV deals with the physics and chemistry of vision, the biochemistry and metabolism of the eye, and the intraocular pressure. This section reveals the tremendous amount of work being carried on in the research laboratories of the world and the refinement in biochemical and biophysical technique since the turn of the century.

Part V deals with the newer conceptions in pathology. The contributions of embryology and heredity and constitutional changes are elaborated. The discussion of the corneal dystrophies and retinal and choroidal abiotrophies is elaborate and excellently illustrated.

Part VI deals with treatment. Local chemotherapy, shock therapy, physical therapy, ionization, iontophoresis, galvanism, electrolysis, high-frequency current, diathermy, coagulation, ultrashort-wave, and actinotherapy are discussed. Modern methods of anesthesia are elaborated by H. B. Stallard.

The diathermy treatment of retinal detachment and the results of treatment are given by H. J. M. Weve along with the method of making a complete and exhaustive examination of the eye. The operative technique is discussed and illustrated in great detail. Successful results were obtained in 83 percent of 112 eyes during 1937. Weve states that a "skilled operator is in a position to obtain success in about 90 percent of fresh cases of 'ruptural' detachment."

There is a chapter on transplantation of the cornea by Filatov who, with his colleagues, had performed 537 transplantations by the end of 1938. Successful transplants were obtained in 24 percent, using living grafts, and in 52 percent using grafts from cadavers. The technique of the operation is well illustrated.

Part VII deals with the social aspects of ophthalmology, particularly in aviation, industry, and chemical warfare.

This volume, published in 1940, contains contributions from well-recognized authorities on three continents and marks a high point in scientific achievement. It also serves as a monument to the universality of medical science in these times.

William M. James.

CLINICAL ASPECTS OF OCULAR INVOLVEMENT IN LEPERS. By José Mendonca de Barros. Paper 79 pages. 60 colored plates and 36 stereoscopic photographs. Archives of the Padre Bento Sanitarium for Prevention of Leprosy. São Paulo, Brazil, 1939.

This book, published in the Portuguese language, also contains a slightly condensed translation into English, giving both the text and the legends for all its illustrations. For most English-speaking readers, these illustrations will be the most important part of the book.

Since the discovery of the lepra bacillus

and its significance and life history, leprosy has rapidly disappeared from the older, highly civilized populations of the world. Many widely experienced members of the medical profession have never seen a case; and ophthalmologists in this country are not likely to have an opportunity to become familiar with the appearances it commonly presents. On this account these illustrations, each with its descriptive legend, offer an opportunity to learn to recognize what has been a very grave and terrible disease throughout human history. These illustrations are based upon the ocular lesions observed among 1,194 cases of leprosy. They show lesions of the lids, conjunctiva, cornea, iris, and crystalline lens. Many are based on studies with slitlamp illumination. This valuable contribution to scientific ophthalmology comes from the Service for Prevention of Leprosy, of the State of São Paulo in Brazil.

Edward Jackson.

OBITUARIES

SAMUEL HORTON BROWN
1878-1940

At the time of his death, on June 12th of this year, Dr. Brown was widely known as an active member of the Philadelphia County Medical Society and the editor of its Weekly Roster and Medical Digest. But he was also worthy of being remembered as an ophthalmologist.

He was born in Philadelphia in 1878, and received his medical degree at the University of Pennsylvania in 1899. He, with George E. de Schweinitz and William Zentmayer, took the examinations of the American Board of Ophthalmology in 1917, the first year after the examinations were started. He did some important writing on ophthalmic subjects in his earlier years, but was never active in the national societies. His later years were given to building up the Bulletin of his country society, and to supporting its Section on Diseases of the Eye.

Dr. Brown was a Fellow of the College of Physicians of Philadelphia, with its Section on Ophthalmology, and also of the American Academy of Ophthalmology and Otolaryngology. He lived and worked in the most active period of the development of modern ophthalmology, but he kept his interest in developments in other parts of the broad field of medicine.

Edward Jackson.

GEORGE A. BERRY
1853-1940

Sir George Andreas Berry, of Scotland, died on the eighteenth of June, in his eighty-seventh year. His father had been a Danish consul, and an uncle was Professor Edmond Hansen Grut, the ophthalmologist of Copenhagen. Berry studied at the University of Edinburgh, and showed special ability in mathematics, before taking his course in medicine. He received the medical degree in 1876, worked in the Moorfields Hospital, and in 1882 was appointed to the eye staff of the Edinburgh Royal Infirmary. Most of his papers were published in the Ophthalmic Review, beginning with a history of two cases observed in the Moorfields Hospital. His work on "The diseases of the eye" was published in 1889, and dedicated to his uncle. In 1893 a second edition was published in Philadelphia. In this he noted the assistance he had received from Drs. E. E. Maddox and Sydney Stephenson.

Berry was a musician. When an American visitor spoke of the skill with which his fingers managed the cataract operation, an assistant said: "You should see him with the cello." His broad interests

made him expert in the Scandinavian languages. He was an original member of the Ophthalmological Society of the United Kingdom, and in his address as president, in 1916, he brought together interesting points of the long history of ophthalmology. He was a member of Parliament, representing the Scottish Universities from 1922 to 1931. He was knighted, in 1916, for public services, including the organization of an ophthalmic department of a general hospital, in the World War. He was known as a keen golfer and fisherman. After his retirement he became a gardener.

Edward Jackson.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

ASSISTED BY DR. GEORGE A. FILMER

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

9

CRYSTALLINE LENS

Darby, W. J., and Day, P. L. **Blood-sugar levels in rats receiving the cataractogenic sugars, galactose and xylose.** Jour. Biol. Chem., 1940, v. 133, April, p. 503.

Young rats placed on a diet 35 percent of which was made up of glucose, fructose, mannose, or arabinose, did not develop cataracts. Similar diets containing xylose or galactose were cataractogenic. The rats fed on the latter carbohydrates showed elevated blood-sugar levels, but the hyperglycemia bore no simple relationship to the rapidity of cataract formation. In conclusion, at least one other monosaccharide (xylose) beside galactose has cataractogenic power.

F. M. Crage.

Lebensohn, J. E. **The biochemistry of the lens: a résumé.** Amer. Jour. Ophth., 1940, v. 23, July, pp. 784-792.

Meyer, K. **Ectopia lentis with later dislocation of the lens on the disc.** Klin. M. f. Augenh., 1940, v. 104, April, p. 436.

A case of dislocation of the shrunken lens on the papilla. During an observation of seven months no change in position of the lens on the papilla could be ascertained. The case was complicated by secondary glaucoma for which a cyclodialysis was performed. This procedure did not influence the position of the lens. C. Zimmermann.

Orzalesi, F. **Researches on experimental cataract from avitaminosis B_2.** Boll. d'Ocul., 1939, v. 18, Aug., pp. 631-640.

In order to ascertain the metabolic changes of cataracts from avitaminosis B_2 the writer first ascertained the respiratory power and glycolysis activity of normal lenses of albino rats. His findings are given in tabulated form. (Bibliography.) M. Lombardo.

Pignalosa, Guiseppe. **Comparative researches on respiration and glycolysis of the various parts of the lens.** Boll. d'Ocul., 1939, v. 18, Aug. pp. 646-658.

Having measured the respiration and glycolysis of the capsule, the cortex, and the nucleus of calf lenses, the writer comes to the following conclusions. The lens capsule has a slight respiratory activity and its glycolysis is higher than that of the cortex and nucleus. The glycolysis activity of the cortical substance is higher than that of respiration. The respiratory activity of the capsule is lower while the glycolysis is higher than that of the other parts. (Bibliography.) M. Lombardo.

Sironi, Luciano. **Bilateral symmetric ectopia lentis and arachnodactylia.** Boll. d'Ocul., 1939, v. 18, Aug., pp. 671-684.

A boy of 11 years showed all the somatic characteristics of Marfan's syndrome. After discission of the dislocated lenses the patient's vision improved to 4/10 with correction. (Bibliography, 9 figures.) M. Lombardo.

Weekers, Roger. **The hydrocarbon metabolism of the crystalline lens.** Ann. d'Ocul., 1940, v. 177, March, pp. 118-131.

The energy requirements and nutrition of the lens, permeability of the capsule, glycolysis, and oxidation-reduction systems are discussed with extensive reference to the literature.
John M. McLean.

10

RETINA AND VITREOUS

Dashevskii, A. I. **Embolism of the central retinal artery and retinal angiospasm.** Viestnik Opht., 1939, v. 15, pt. 6, p. 56.

Dark-adaptation tests for the various retinal areas disclose functional impairment and functional recovery under therapy. The author uses his own apparatus. These findings afford a differential diagnosis between angiospasm and embolism, which is not possible by means of the fundus picture. The differential diagnosis is of clinical importance because in angiospasm retrobulbar injections of atropine are of value. Ray K. Daily.

Grimsdale, Harold. **Spasm of a branch of the central artery. A personal experience.** Brit. Jour. Ophth., 1940, v. 24, May, pp. 208-211.

The author noted in his own right eye a positive reddish-purple scotoma which lasted ten minutes. On examination nothing abnormal was found. Following a recurrence ten days later, examination revealed an empty macular branch of the superior temporal vessel. Just above was a small retinal hemorrhage. The field showed wedge-shaped absolute scotoma, with its apex just below fixation, and extending down to the lower field limit. Three months later, following the use of acetylcholine injections and doryl tablets, the scotoma included a small absolute area at the apex while over the balance of the field the object could be seen flashing in and out. It is probable that new lateral vessels bringing blood to the area prevented complete destruction. (Illustrations.)
D. F. Harbridge.

Grosz, István. **Bilateral occlusion of the central retinal artery.** Orvosi Hetilap, 1940, v. 84, April, p. 187.

A 67-year-old man noticed sudden deterioration of vision in his left eye. Examination, 16 hours later, revealed signs of a fresh embolus of the central retinal artery. Inhalation of amyl ni-

trite, subconjunctival injection of acetycholine, intravenous injection of acetylcholine, and intravenous injection of neotroparin proved of no avail. Four years earlier the patient had been blinded in his right eye under similar circumstances. R. Grunfeld.

Hofe, K., and Glees, M. **The evaluation of hemeralopia in belligerents.** Klin. M. f. Augenh., 1940, v. 104, April, p. 369.

One hundred soldiers who complained of hemeralopia were examined and those whose dark adaptation was reduced to one third of normal were considered unfit for service. Almost one half of this number had decreased dark adaptation of familial, congenital, or constitutional origin. Hence the demand is made that every man conscripted be questioned relative to symptoms of night blindness. If he answers in the affirmative a careful examination should be made.

C. Zimmermann.

Luo, T. H., and Ch'en, H. L. **Ophthalmodynamometric findings in the Chinese.** Chinese Med. Jour., 1939, v. 56, Oct., p. 345.

Retinal vascular pressures were measured with the ophthalmodynamometer of Sobanski on 41 healthy Chinese clinic patients. With an average brachial blood pressure of 108.5 mm./67.9 mm. of Hg, the retinal arterial pressure averaged 40.9 mm. Hg in the diastolic, and 82.2 mm. in the systolic phases. Generally the retinal arterial pressure rises with increasing age and increasing general blood pressure. Retinal vascular pressures in the two eyes of the same person are considered to be the same. F. M. Crage.

McArevey, J. B., and Somerville-**Large, L. B. Eales's disease.** Trans. Ophth. Soc. United Kingdom, 1939, v. 59, pt. 2, p. 835.

A woman 26 years of age had had recurrent hemorrhages into the vitreous for two years. Clinical investigation was negative except for a strongly positive Mantoux intradermal tuberculin reaction and a marked deficiency of vitamin C in the urine. The patient showed no real improvement when under tuberculin, but responded to treatment when the diet was corrected to overcome vitamin-C deficiency. The second patient, a man forty years of age, had had recurrent hemorrhages over a long period. Clinical investigation gave negative results with the exception of marked vitamin-C deficiency in the urine. In three young men between the ages of 24 and 28 years definite tuberculous lesions of the hilum glands were present, with strong reactions to intradermal tebeprotein (1 to 10,000).

Beulah Cushman.

Radnód, Magda. **Angioid streaks on the fundus. Elastosis dystrophica.** Orvosi Hetilap, 1940, v. 84, April, p. 190.

Angioid streaks were seen in both retinas of a 33-year-old man with myodegeneration of the heart but with no signs of an elastic pseudoxanthoma of the skin. The author discusses the various theories of origin. The fundus picture characterizes a systemic disease in which changes of the skin and of the cardiovascular system occur together with changes in the retina. The changes everywhere consist in degeneration of elastic and collagen fibers and, therefore, the author prefers the name elastosis dystrophica after Böck.

R. Grunfeld.

Schauren, Josef. **Retinal detachment and indirect trauma.** Graefe's Arch., 1940, v. 141, pt. 1, pp. 72-98.

In this paper the author is concerned with "idiopathic" detachment, excluding secondary separation of the retina. As indirect trauma he refers to those accidents which cause concussion or vibration of the head or body, excluding severe head injuries. Physical strain comes under indirect traumas. The writer makes a thorough study of the literature dealing with retinal detachment and the theories of its causation. Among 6,475 examples of eye accidents, Zahor Aleksey found only 69 retinal detachments. Basing his conclusions upon an analysis of the literature, the author believes that idiopathic retinal detachment is a slowly developing and independent disease of the eye, not related to indirect trauma.

C. A. Perera and U. Ollendorff.

Spratt, C. N. **Recurring hemorrhages in the vitreous following Gonin operation.** Amer. Jour. Ophth., 1940, v. 23, July, pp. 806-807.

Walker, C. B. **Use of the Purkinje figures as test for separated retina and other intraocular pathology.** Amer. Jour. Ophth., 1940, v. 23, July, pp. 803-804; also Trans. Amer. Acad. Ophth. and Otolaryng., 1939, 44th mtg., p. 399.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Brown, T. H. **Cerebrospinal disease and its relation to the optic nerve.** Trans. Ophth. Soc. United Kingdom, 1939, v. 59, pt. 2, p. 861.

Detailed discussion of the diseases of the optic nerve and retina as a part of the central nervous system. The first part is devoted to a description of the abnormalities to be seen on ophthalmoscopic examination and to consideration of the deductions which are to be made from them, together with remarks on nomenclature. The second part is devoted to the various diseases of the central nervous system in which such abnormalities occur. (Many illustrations, plates, and cuts.)

Beulah Cushman.

Casini, Francesco. **The respiratory metabolism of the retina in experimental intoxication by quinine.** Arch. di Ottal., 1939, v. 46, Sept.-Oct., p. 263.

Rabbits were utilized for a series of experiments, and variable doses of quinine were injected. Following the technique of Warburg-Jabusoe, the respiratory metabolism of the retina was measured after the injection of quinine. The problem considered was whether the blindness was a result of vascular factors, or whether the alkaloid itself had a specific effect on the nerve elements. The author found a constant diminution in oxygen consumption in cases of chronic quinine poisoning. By experiments in vitro, he obtained total abolition of oxygen consumption. These results would speak in favor of the direct toxic action of quinine salts on the retinal elements.

H. D. Scarney.

Leinfelder, P. J. **Retrograde degeneration in the optic nerves and tracts.** Amer. Jour. Ophth., 1940, v. 23, July, pp. 796-802; also Trans. Amer. Acad. Ophth. and Otolaryng., 1939, 44th mtg., p. 190.

Meisinger, H. A. **The use of choline in optic atrophy and diseases of the retina.** Viestnik Opht., 1939, v. 15, pt. 6, p. 87.

A report of nine cases of optic atrophy caused by plasmocide, in which acetylcholine was used intravenously. Vision was improved in most cases, but the severe constitutional reactions call for research on this procedure.

Ray K. Daily.

Turvey, S. E. C. **The use of tryparsamide in the optic atrophies of syphilis.** Canadian Med. Assoc. Jour., 1940, v. 42, March, pp. 264-267.

From a series of 354 cases of neurosyphilis treated with tryparsamide, 15 cases of primary optic atrophy are reported. In two cases the drug was probably harmful, while in five the visual failure had been arrested for periods varying from six months to two years; in nine cases there had been improvement in visual acuity. As most of these patients had had malarial treatment, it was not concluded that tryparsamide produced all the good effects, but the author believes that tryparsamide is not contraindicated in the optic atrophy of syphilis. T. E. Sanders.

Werncke, T. **Angioma of the optic disc (Caput Medusae).** Klin. M. f. Augenh., 1940, v. 104, April, p. 434.

Twenty years previously, a 27-year-old woman had had an apoplexy with paresis of left arm and leg and the right facial nerve, and with lagophthalmos. The right optic disc was not visible, instead there was seen a convolution of veins like a lump of earth worms. This angioma of the disc was accompanied by venous anomalies and aneurysms at the periphery.

C. Zimmermann.

12

VISUAL TRACTS AND CENTERS

Bender, M. B., and Kanzer, M. G. **Dynamics of homonymous hemianopsias and preservation of central vision.** Brain, 1939, v. 62, Dec., pp. 404-421.

The authors report their observations of progressive hemianopsia associated with tumor of the brain in 600 cases. They conclude that there is a concomitant relationship between visual acuity, color vision, and peripheral defects in the visual field. "Macular sparing" is believed to be a stage in the development of a complete hemianopsia, the defects beginning in the periphery and gradually spreading toward the center. Careful examination of the "preserved" field of vision will often disclose diminished visual acuity and impairment of color vision.

T. E. Sanders.

Giscard. **Encephalitis of pseudotumor form.** Bull. Soc. d'Opht. de Paris, 1938, Oct., p. 489.

A clinical report of a condition which the author regards as rare. The principal symptom during the course of an encephalitis with high intracranial pressure was a unilateral paralysis of the third nerve. There was no choked disc, but other symptoms of dangerous intracranial pressure supervened which were relieved by decompression. At the end of ten months the patient was in good health and had returned to work. There still remained a total paralysis of the intrinsic muscles, and partial paralysis of the extrinsic muscles of the affected right eye. In the discussion, warning is given that at a later stage of development a true tumor might be recognized in such so-called pseudotumor cases. Jerome B. Thomas.

Plaut, A., and Dreyfuss, M. **Spontaneous hemorrhage into oculomotor nerve with rupture of nerve and fatal subarachnoid hemorrhage.** Arch. Neurology and Psychiatry, 1940, v. 43, March, p. 564.

A 65-year-old white male complained of headache, vomiting, and drooping of right upper eyelid. After five weeks the diagnosis mentioned in the title was made at autopsy. There is nothing in the literature upon rupture of the oculomotor nerve from hemorrhage.

Theodore M. Shapira.

Roaf, H. E. **The relation of the retinae to the cerebral cortex.** Trans. Ophth. Soc. United Kingdom, 1939, v. 59, pt. 1, p. 383.

The author presents the theories of Ramon y Cajal and Suttie and proposes his own theory that motor fibers cross because of the inversion of images by the lens; while subsequently the afferent tracts (including the optic tracts of animals with panoramic vision) must cross in order to be linked to the centers controlling movements of skeletal muscles. He feels that the evidence suggests that it is the development of the nervous system that makes the mammalian eye so important, rather than that the eyes cause the development of the nervous system. Beulah Cushman.

Rohrschneider, W. **The importance of ocular symptoms in blunt injuries of the head.** Med. Klinik, 1940, v. 36, Feb. 16, pp. 181-83.

A careful eye examination after blunt traumas of the head is of diagnostic and prognostic importance. Basal fractures are often indicated by so-called "spectacle hematoma" (limited to the eyelids), provided no direct lid injury has occurred. More valuable signs are injuries of the ocular nerve supply, including: facial (22 percent), optic (4 percent), abducens (4 percent), oculomotor (2 percent), trigeminal (1.6 percent), and trochlear (1 percent). Other signs of great importance are the pupillary phenomena, that is amaurotic pupillary paralysis (in injuries of the optic nerve interrupting the sensible reflex arc), absolute pupillary paralysis (in traumas of the oculomotor interrupting the motor reflex arc), and dilatation of the pupil in sympathetic irritation, which points to a subdural or epidural hematoma usually on the side of the wider pupil. This unilateral dilatation of the pupil through sympathetic iritation is a very important indication for an immediate decompression, without waiting for the patient to regain consciousness, especially when the sign has developed under observation. Bertha A. Klien.

Shumway, E. A. **Tumor of the third ventricle with resulting chronic internal hydrocephalus.** Arch. of Ophth., 1940, v. 23, April, pp. 727-734.

A case of chronic internal hydrocephalus in a boy ten years of age is reported. Associated symptoms were papilledema with failing vision and contracted visual fields, and partial oculomotor involvement. Decompression brought about relief of the intracranial pressure, with improvement of vision and widening of the fields. Gradual mental deterioration, spells of unconsciousness, and (later) convulsive attacks occurred. There was rhinorrhea due to erosion and perforation of the cribriform plate. Death occurred at 27 years of age from extensive subdural cerebral hemorrhage due to accidental traumatism. Autopsy showed the presence of an infiltrating tumor (astrocytoma) of the hypothalamus and the third ventricle, extending through the aqueduct of Sylvius into the fourth ventricle, partially blocking the outflow of ventricular fluid, and accompanied by metastatic hemorrhagic encephalitis of the cerebral cortex. The

appearance of the brain is shown grossly and in sections by photographs. (Discussion.) J. Hewitt Judd.

Whitnall, S. E., and Norman, R. M. **Microphthalmia and the visual pathways. A case associated with blindness and imbecility, and sex-linked.** Brit. Jour. Ophth., 1940, v. 24, May, pp. 229-244.

The patient was the third of four male children; the youngest being blind and mentally defective, the parents and two older boys normal in every respect. After death from bronchopneumonia, the eyes and brain were examined. The report presents the gross and microscopic features of the eyeball, and of the visual pathways, traced along the optic nerves, chiasma, and tracts. Finally the brain as a whole, with the cortical visual areas in particular, was examined. This latter investigation is considered worthy of record in that this procedure is not generally followed. A detailed description of the findings is presented. (Figures, tables, bibliography.)

D. F. Harbridge.

13

EYEBALL AND ORBIT

Casini, Francesco. **Xanthomatosis bulbi with ossification of the choroid.** Arch. di Ottal. 1939, v. 46, Nov.-Dec., p. 333.

A case of xanthomatosis bulbi is reported showing marked inflammatory reactions in the iris and choroid with hemorrhages; deposition of fat in all the ocular tissue; ossification of the choroid; and an increase in the free, combined, and total cholesterol, fatty acids, and neutral fats in the blood serum. (Colored plate, photomicrographs.) H. D. Scarney.

Dalsgaard-Nielson, Esther. **Orbital pseudotumor.** Acta Ophth., 1939, v. 17, pt. 4, p. 418.

Review of the literature and report of two cases. A girl 19 years old had an exophthalmos of the left eye; a diagnosis of orbital neoplasm was made and the tumor was removed. On histologic examination it was found to consist of inflammatory tissue. The second patient, a woman seventy years old, had the left orbit exenterated on the diagnosis of malignant tumor. Microscopic examination revealed the presence of a chronic dacryoadenitis spreading into the orbit. (Photomicrographs.) Ray K. Daily.

Igersheimer, Joseph. **Inflammatory processes of the bony rim of the orbit.** Türk Oft. Gazetesi, 1938, v. 2, pt. 11, p. 536. (French abstract: 1938, v. 2, pt. 12, p. 605.)

The author reports three cases, the first one being acute osteomyelitis of the lower rim of the orbit due to Löffler's bacillus. Staphylococcus aureus and streptococcus were also present in the pus, and a fistula from the maxillary sinus was found. Administration of antidiphtheric serum effected a cure, and four years later the ectropion of the lower lid at first present had disappeared. The involvement of the lower lid was undoubtedly an extension from the nose and sinuses. The second case was that of a girl aged five years who showed an ulcer of the outer portion of the lower lid and the underlying bony orbital rim. In addition there was a tuberculous process of the left forearm and scrofulous dermatitis of the brachium. The third case, that of a man aged 34 years, presented a swelling of the external portion of the lower left eyelid which was tender to the touch; but with no engorgement

of the regional lymph glands. There was also a fistula of the upper gingivojugal ridge at the level of the large molar. Pressure on the lid tumor produced pus at the buccal end of the fistula. The lesion was proved to be tuberculous by intraperitonal injection in a guinea pig. Incisions into the lid swelling resulted in its disappearance and closure of the fistula.

George H. Stine.

Khordas, C. M. **Experiments as to temperature topography of the eye.** Viestnik Opht., 1940, v. 16, pt. 1, p. 12.

The objective of this laboratory study on rabbits was to determine the effect of a number of factors on the temperature of the various ocular structures. The data show that the temperature of the conjunctival sac is 35.84°, of the corneal surface 29.13°, and of the anterior chamber 34.55°. The low surface temperature of the cornea and sclera is due to their poor heat conductivity and high heat loss. The instillation of cocaine lowers the temperature by widening the palpebral fissure and increasing heat loss. Pain produced experimentally by an induction current lowers the temperature. There is also a fall in the temperature of the fellow eye, which is here attributed to an increased adrenalin content of the blood, reducing heat production. Subconjunctival injection of hypertonic salt solution raises the temperature, the hyperemia increasing the heat production and the edema reducing heat loss. Puncture of the anterior chamber causes a rise in temperature for two days. Perforating injuries of the ciliary body cause a temperature rise for three days. Section of the sympathetic ganglion indicates that hyperemia increases ocular temperature.

Ray K. Daily.

Radzichovskii, B. L. **Orbital cellulitis of malarial etiology.** Viestnik Opht., 1939, v. 15, pt. 5, p. 87.

In a boy 15 years old cellulitis accompanied a malarial attack. The patient recovered in ten days under antimalarial treatment. (Illustration.)

Ray K. Daily.

Spector, S. A. **Intermittent exophthalmos.** Viestnik Opht., 1939, v. 15, pt. 5, p. 73.

A woman 32 years old complained of an intermittent exophthalmos which increased when she leaned forward and receded when she lay down. She gave a history of attacks of exophthalmos with loss of vision, orbital pain, nausea, and hemorrhage into the orbit. There was no evidence of varicose orbital veins. She had a chronic cholecystitis and frequent nasal bleeding. The author believes that the entrance of blood from the nose into the orbit in the course of a nasal hemorrhage produced the clinical picture. He assumes the presence of a connection between the left nasal cavity and the left orbit.

Ray K. Daily.

Sverdlov, D. G. **Centers for fitting artificial eyes and courses for the makers of ocular protheses.** Viestnik Opht., 1940, v. 16, pt. 1, p. 80.

The author believes that there should be close coöperation between the ophthalmologist and the maker of artificial eyes, and that ophthalmologists should have some knowledge of the technologic process involved. He urges that the curriculum in opthalmology include a course on artificial eyes.

Ray K. Daily.

Todd, T. W., Beecher, H., Williams, G. H., and Todd, A. W. **The weight and growth of the human eyeball.** Human Biology, 1940, v. 12, Feb., p. 1.

An attempt has been made to obtain data on the size of the human eyeball in adult life and its growth during childhood. For this, 215 pairs of eyeballs from individuals ranging from birth to adult age were examined. Weight was taken by distention of the eyeball by water to restore approximate living intraocular pressure. The authors conclude that eyeball growth in general follows brain growth but final eyeball weight shows no correlation with cranial capacity. The negro eyeball is larger than that of the white. Female eyeballs, though absolutely smaller, are larger than male eyeballs in relation to size of body. No real change in eyeball size after adult weight is reached can be demonstrated. Approximate childhood weight is reached by the age of three years. The conclusion of earlier observers that most of the growth takes place in fetal life is confirmed but the data point to considerable growth during the first year continued with diminished velocity to the third birthday and followed by a secondary growth possibly concentrated near adolescence. (20 references.) Ralph W. Danielson.

14

EYELIDS AND LACRIMAL APPARATUS

Aldridge, J. S., and Kirk, R. **Mycetoma of the eyelid.** Brit. Jour. Ophth., 1940, v. 24, May, pp. 211-213.

The patient had a tumor mass about the size of a marble situated at the outer angle of the upper lid. Sections of the growth showed a nonspecific inflammatory lesion characterized by hyaline fibrosis, plasma cells, and leucocytic infiltration, with a few giant cells. Little in the way of detailed structure could be made of fungus grains which were irregularly distributed in the more densely infiltrated parts. There was no attempt to culture the grains but findings were sufficient to establish a diagnosis of mycetoma. (Figure, references.)

D. F. Harbridge.

Alexseev, S. A. **Transplantation of cadaver mucous membrane in the Millingen-Sapeshko operation.** Viestnik Opht., 1939, v. 15, pt. 6, p. 77.

In transplanting mucous membrane from the lip into the intermarginal space for trichiasis the author finds mucous membrane from the lip of a cadaver just as effective as the patient's own mucous membrane. Using cadaver tissue spares the patient the discomfort of an incision in the lip.

Ray K. Daily.

Castelli, Adolfo. **Para-aminophenol-sulphanilamide in dacryocystitis.** Boll. d'Ocul., 1939, v. 17, July, pp. 523-530.

The writer treated with this drug 21 cases of dacryocystitis, five cases of phlegmon of the sac, and five cases of lacrimal fistulas. He concludes that the sulphamide is a good adjuvant to the usual treatment. (Bibliography.)

M. Lombardo.

Ch'en, H. S. **Secondary hemorrhage following chalazion operation in chronic myeloid leukemia.** Chinese Med. Jour., 1939, v. 62, Dec., pp. 559-563.

A case of secondary hemorrhage following an operation for chalazion in a patient suffering from chronic myeloid leukemia is reported. The bleeding started on the third day after operation, subsequently recurred at frequent intervals, and was accompanied by the rapid growth of a tumor from the chalazion wound. Section of this tumor revealed "granulation tissue with myelocytic infiltration." The bleeding was effectively controlled and the tumor

destroyed by local irradiation with X rays, after all other methods had failed. T. E. Sanders.

Corboy, P. M. **Simplifying the Dupuy-Dutemps operation (dacryocystorhinoplasty).** Amer. Jour. Ophth., 1940, v. 23, July, pp. 810-811.

Dimitry, T. J. **Transilluminating and trephining the chalazion: the instruments for this purpose.** Amer. Jour. Ophth. 1940, v. 23, July, pp. 807-809.

Gekker, I. P. **Complications in the treatment of dacryocystitis.** Viestnik Opht., 1939, v. 15, pt. 6, p. 68.

The following complications are reported: two cases of anaphylactic shock with edema of the face and respiratory mucous membrane following irrigation of the lacrimal sac with a Besredka vaccine of staphylococcus aureus; one case of septic lymphadenitis; and one of chronic phlegmon following extirpation of the lacrimal sac.

Ray K. Daily.

Hagedoorn, A. **Concretions in a lacrimal canaliculus caused by actinomyces.** Arch. of Ophth., 1940, v. 23, April, pp. 689-692.

The author describes the clinical picture produced by actinomyces in the superior and inferior canaliculi, and gives a method for obtaining a pure culture of the organisms. (Photographs.) J. Hewitt Judd.

Işik, Mahmut. **A new operative procedure for trichiasis of the lower lid.** Türk Oft. Gazetesi, 1938, v. 2, pt. 11, p. 542. (French abstract: 1938, v. 2, pt. 12, p. 607.)

The author reports two cases in which he used with complete success the method of Sitki Yüce. A description of the operation is given. A horizontal musculocutaneous fold is taken between the blades of Péan's forceps from 3 to 4 mm., below the free border of the lid and parallel to it. Four or five sutures are then passed behind the cilia to emerge below the forceps. A fold nearly level with the forceps is excised, the sutures are tied but not cut, and the threads brought forward to the middle of the cheek to form Gaillard sutures. George H. Stine.

Poštić Svetozar. **A second case of contact gumma formation on the lid margins in the shape of an impression ulcer.** Klin. M. f. Augenh., 1940, v. 104, April, p. 433.

Two cases are described which confirm the conception of Noguchi and Klausner as to such contact gummata being caused by allergy of the skin to spirochetal products.

C. Zimmermann.

Riddell, W. J. D. **Congenital absence of tears.** Glasgow Med. Jour., 1940, v. 133, March, p. 85.

Riddell reports the case of a healthy female child aged five years, during whose lifetime no tears had been shed. The lids were healthy and the puncta were of normal size. Examination of the cornea with a monocular loupe showed no signs of any of the changes which are associated with keratitis sicca. No other members of the family had similar trouble. References are made to the observations of other authors. The author further states that the condition may lead to the appearance of keratitis sicca. Mention is made of the four etiologic groups into which congenital absence of tears may be divided. F. M. Crage.

Shartz, S. E. **Tarsorrhaphy as a therapeutic procedure in some corneal**

diseases. Viestnik Opht., 1939, v. 16, pt. 1, p. 33. (See Section 6, Cornea and sclera.)

15

TUMORS

Albers, E. C. **Benign melanomas of the choroid and their malignant transformation.** Amer. Jour. Ophth., 1940, v. 23, July, pp. 779-783.

Ballantyne, A. J. **Two cases of epibulbar osteoma.** Ophthalmologica, 1940, v. 99, March, p. 87.

Ballantyne describes epibulbar osteoma in two girls and believes that it occurs much more frequently than one would be led to believe by the fact that it has been described only 17 times in 75 years. In each of the author's cases a nodule had been present since birth. The conjunctiva was movable over it, but it was adherent to the sclera. After decalcification, histologic preparation revealed true bone.

The cases in which bone occurs in the human eye may be considered in three categories. In the first, to which the subject of this communication belongs, the bone takes the form of an isolated nodule attached to the sclera or embedded in the connective tissue of the conjunctiva and is unaccompanied by any other abnormality of the eyeball. In the second, bone occurs in a microphthalmic eye and is associated with a lipodermoid or some other teratoid growth. In the third, there is a deposit of bone in tissues which have been the seat of an inflammatory or degenerative process—above all in the choroid. In every case, the bone is formed in primitive connective tissue. In congenital growths it is derived directly from the primitive undifferentiated mesoblastic tissue, but when bone is formed pathologically it develops either in new-formed undifferentiated connective tissue or in a mature connective tissue which has reverted to its primitive form and has been redifferentiated to form bone.

F. Herbert Haessler.

Cibis, Paul. **The subretinal fluid in melanosarcoma of the choroid.** Klin. M. f. Augenh., 1940, v. 104, April, p. 424.

In five cases of melanosarcoma of the choroid the melanin test with iron chloride showed a positive reaction in the subretinal fluid. The test was negative for the aqueous, vitreous, and subretinal fluids in idiopathic detachments. Thus the reaction may be of value for differential diagnostic purposes.

C. Zimmermann.

Davis, F. A. **Primary tumors of the optic nerve (a phenomenon of Recklinghausen's disease).** Arch. of Ophth., 1940, v. 23, April, pp. 735-821, and May, pp. 957-1022; also Trans. Sec. on Ophth., Amer. Med. Assoc., 1939, 90th mtg., p. 145.

This monograph is a clinical and pathologic report of tumors of the optic nerve associated with Recklinghausen's disease and is based on a study of five cases and a review of the literature which reveals at least 32 authentic cases. The term "neurofibromatosis" or "neurofibroma," as applied to tumors of the optic nerve, should be abandoned since it conveys the impression that the lesion resembles, or is identical with, neurofibromas of the peripheral nerves. The author believes that they are an expression of the same general disease, but the histologic structure of the tumors is different. The tumor of the optic nerve is not a "neurofibromatosis" or "neurofibroma" but is usually a glioma or at times an endothelioma.

It is possible that the finer branches of the peripheral or sympathetic nerves which enter the optic-nerve stem with the blood vessels along the pial invaginations might be subject to a neurofibromatosis in its strictest sense. The term has been frequently loosely employed, however, to describe tumors which belong to the glial or endothelioma groups. This study indicates that glial tumors start with an abnormal proliferation of the normal adult types of neuroglia of the nerve stem. After varying periods of growth, the abnormal neoplastic neuroglial cells penetrate the pia, with the formation of a gliomatous tumor in the sheath. Proliferation of the mesothelial cells of the arachnoid follows the glial penetration of the pia, with the formation of a tumor-like mass in this portion of the nerve sheath. Later, intermingling of the proliferated cells from these two areas produces a complex histologic structure, the precise nature of which is difficult to interpret unless earlier stages of the growth have been studied. Study of sections from these tumors reveals five different stages in the evolution of their growth, each of which is described. Since these growths exhibit all the characteristics of true tumors they should be designated as gliomas. The author discusses the character of the neoplastic cells, as revealed by a special staining, and gives the various theories as to the causation of the tumors. That tumors of the optic nerve are in many, if not most, instances but a part of a more widely disseminated lesion of the peripheral and central nervous system is borne out by the fact that the tumors are bilateral at times and that multiple involvement of the nerve has been found. The slow rate of growth and the relatively benign nature of the tumors are characteristic of other lesions associated with this syndrome. (Bibliography, discussion.)

J. Hewitt Judd.

Gözberk, R., and Duydal, I. **Pedunculated osteoma of the orbit originating in the frontal sinuses.** Türk Oft. Gazetesi, 1938, v. 2, pt. 9, p. 427. (French abstract: 1938, v. 2, pt. 11, p. 583.)

A patient aged 15 years presented an exophthalmos of the left eye due to a hard and adherent mass in the upper inner angle of the orbit, extending backward. The movements of the globe were normal and the vision was unaffected. X ray showed the mass to originate in the frontal sinuses. The tumor, removed surgically, proved to be an osteoma arising from the floor of the frontal sinus. George H. Stine.

Gözcü, N. I. **Radiotherapy in cancer of the cornea.** Türk Oft. Gazetesi, 1938, v. 2, pt. 9, p. 421. (French abstract: 1938, v. 2, pt. 11, p. 582.)

The author reports two cases of carcinoma of the cornea in which radiotherapy produced a cure.

George H. Stine.

Kindt, Peter. **Statistics of melanosarcoma and glioma.** Acta Ophth., 1939, v. 17, pt. 4, p. 443.

The material studied consisted of 259 cases of melanosarcoma and 262 cases of glioma. After correcting the mortality statistics for the various errors incident to such calculations, the mortality for choroidal sarcoma was found to be 47 percent, and for glioma 44 percent. For melanosarcoma the mortality is constant during the first 13 years after operation, while in glioma the mortality increases rapidly after operation but becomes nil three years later. It is thus concluded that

a patient may be considered cured three years after enucleation for glioma; whereas after enucleation for melanosarcoma 14 years must pass before the patient may be considered cured. Ray K. Daily.

Kraupa, Ernest. **Muscle xanthoma as the cause of recurrence of excised xanthoma of the lids.** Ophthalmologica, 1940, v. 99, April, p. 195.

It is the author's opinion that when lid xanthoma recurs after excision, it arises from xanthoma of the muscle. To prevent recurrence the affected parts of the subcutaneous muscle must be completely removed.

F. Herbert Haessler.

MacDonald, A. E. **Lindau's disease.** Arch. of Ophth., 1940, v. 23, March, pp. 564-576; also Trans. Amer. Ophth. Soc., 1939, v. 37, p. 236.

In two generations of two families, six cases of Lindau's disease have been found among eleven members. The presence of a cerebellar hemangioendothelioma was verified surgically in four cases. The possibility of angiomatosis retinae as the cause of blindness in the second and third decade must be borne in mind, for secondary glaucoma or hemorrhage may obscure the diagnosis. Angiomatosis retinae occurs in the cerebral layer of the retina and may be one of multiple hemangioendotheliomas of the central nervous system. Since these tumors are susceptible to treatment by irradiation, the successful treatment of Lindau's disease seems possible, although further observation of treated patients is needed to show if the apparent relief of symptoms is lasting. Both terms, Lindau's and Hippel's disease, must be retained, for while both conditions have a familial tendency, Hippel's disease may occur without complications. Multiple hemangioendotheliomas must be demonstrated to justify a diagnosis of Lindau's disease; or, if only one tumor is found pathologically, familial incidence must be shown. (Discussion.)

J. Hewitt Judd.

Pagès, R., Stora, E., and Duguet, J. **Primary sebaceous epithelioma of the meibomian glands.** Bull. Soc. d'Opht. de Paris, 1938, Dec., p. 621.

This condition is said to be rare and the report is of particular interest because of the histopathologic sections which permit one to follow the tumoral evolution of the sebaceous cells. (5 figures, including 4 photomicrographs.)

Jerome B. Thomas.

Pokrovskii, A. I. **Neoplasms of the orbit.** Viestnik Opht., 1939, v. 15, pt. 6, p. 11.

A comprehensive review of the literature and detailed reports of a case of traumatic orbital cyst and of a case of lymphoma of the orbit. (Illustrations.) Ray K. Daily.

Rocha, H. and Alves Garcia, J. **Lindau's disease and nevus of the face.** Segundo Cong. Brasileiro de Ophth. In Arquivos de Clin. Oft. e Oto-Rino-Laring., 1938, v. 5, Sept.-Dec., pp. 320-327.

Case report of a 17-year-old patient with very poor mental development, an extensive nevus of reddish color extending over the left side of the face, marked ectropion of the upper lid, and several changes in the anterior segment of the eye. X rays revealed opaque shadows in the skull bones corresponding to the occipital lobe. The eye was enucleated on account of extensive pathology of the anterior segment, plus

hypertension. Microscopic examination revealed angioma of the retina.

Ramon Castroviejo.

Santa Cecilia, J. **Optic-nerve tumor.** Segundo Cong. Brasileiro de Ophth. In Arquivos de Clin. Oft. e Oto-Rino-Laring., 1938, v. 5, Sept.-Dec., pp. 307-309.

Case report of a patient with a right exophthalmos of 7 mm. After a clinical diagnosis of tumor of the optic nerve, an operation was performed following Krönlein's technique. Postoperative recovery was uneventful. Microscopic examination showed the tumor to be a neurinoma. Ramon Castroviejo.

Sezer, F. N. **Xeroderma pigmentosum and conjunctival epithelioma.** Türk Oft. Gazetesi, 1938, v. 2, pt. 10, p. 491. (French abstract: 1938, v. 2, pt. 11, p. 585.)

In a boy of twelve years there were numerous pigmented spots of dark color alternating with maculae on the face and other parts of the body. Immediately lateral to the caruncle of the left eye was a grayish tumor the size of an almond with a congested papillomatous surface. It extended laterally to cover the cornea. There was a similar new growth on the nasal side of the limbus of the right eye. The tumors were extirpated and the denuded areas cauterized with galvanic current. Pathologic examination showed these tumors to be basal-cell carcinomas. George H. Stine.

Tomkin, H. **A case of hemangioma of the conjunctiva.** Trans. Ophth. Soc. United Kingdom, 1939, v. 59, pt. 2, p. 837.

A small cystic hemangioma of the conjunctiva (4 by 3 mm.) was removed by the electrolysis needle of a diathermy apparatus. Beulah Cushman.

Weil, A. and Mayer, L. L. **Experimental retinoblastoma.** Arch. of Ophth., 1940, v. 23, March, pp. 591-604.

The present report is concerned with the experiments of injecting superheated lard and olive oil into the vitreous of 34 rat eyes. These injections led to neoplastic disease of the retina. The cells of the ganglion-cell layer which were in direct contact with the injected substance showed active proliferation during the first month. Both the inner and outer nuclear layers responded with cellular proliferation, and active mitosis appeared in the latter about six months after the injection. At the same time invasion of the optic nerve by proliferated retinal cells was observed. The authors favor the term retinoblastoma, since it describes the primitive character of the proliferated cells. The changes observed are shown by photomicrographs.

J. Hewitt Judd.

Wilson, J. M., and Farmer, W. D. **Glioma of the optic nerve.** Arch. of Ophth., 1940, v. 23, March, pp. 605-618.

The authors review the literature and report two cases of primary spongioblastoma of the optic nerve, in one of which there was an extension into the optic disc. Only by complete pathologic study of these tumors will more accurate differentiation and more rational prognosis be possible. The impregnation methods of Ramon y Cajal and del Rio Hortega appear to be the best. Although simple removal by the anterior approach through the orbit may result in apparent cure in many cases, craniotomy should be done, since the chance of operative fatality is outweighed by the more likely chance of permanent cure. The neurosurgical approach should always be made when

there is an enlargement of the optic foramen. J. Hewitt Judd.

Yarlichaeva, S. I. **Atypical neoplasms of the conjunctiva.** Viestnik Opht., 1939, v. 15, pt. 6, p. 80.

An analysis of the microscopic sections of 15 cases. Five were of trachoma, two of plasmoma, five of typical papilloma, and the rest of epithelioma. Because the differentiation between benign and malignant neoplasms is difficult the author urges excision and microscopic study of every conjunctival neoplasm. (Illustration.) Ray K. Daily.

16

INJURIES

Arshavskaja, B. E. **Abscess of the sclera.** Viestnik Opht., 1940, v. 16, pt. 1, p. 68.

A report of this unusual occurrence following a blow with a branch of a tree. The abscess was opened and drained. The causative organism was staphylococcus aureus.

Ray K. Daily.

Baltin, M. M., and Itzikson, L. I. **Methods of bone-free roentgenography of the anterior ocular segment.** Viestnik Opht., 1939, v. 15, pt. 6, p. 45.

A plea for the use of Vogt's method of localization of intraocular foreign bodies. To project a large ocular segment on the plate the authors inject 3 c.c. of 1-percent novocaine behind the globe. As an identification mark they use instead of Vogt's hooks one drop of a bismuth paste on the cornea. (Illustrations.) Ray K. Daily.

Dollfus, M. A., and Borsotti, I. **Tolerance of the nonoxidizable steels in the eye of the rabbit.** Bull. Soc. d'Opht. de Paris, 1938, Oct., p. 422.

The absence of siderosis in eyes containing nonoxidizable steel, as previously reported by the authors (Amer. Jour. Ophth., 1939, v. 22, p. 347), is confirmed by the histochemical examination of eight eyes of rabbits into which small fragments of stainless steel had been introduced and allowed to remain several months (one as long as 245 days) before removal of the eyes for sectioning. The technique of Grohe-Perls with ferrocyanide of potassium was followed. As a result of their experimental research, the authors conclude that the ocular tissues are perfectly tolerant to the nonoxidizable steels of modern industry.

Jerome B. Thomas.

Ereaux, L. P. **The cosmetic eye—a periocular dermatitis.** Canadian Med. Assoc. Jour., 1940, v. 42, April, p. 364.

Blondes outnumber brunettes as reactors to cosmetics. The author mentions that it has been difficult to find the offending agent in cases of cosmetic dermatitis. He discusses powders, rouge, lipstick, and all the various types of creams, soaps, shampoos, after-shaving lotions, cleansing lotions, perfumes, hair dyes, hair restorers, eye shadow, eye drops, nail polishes, and tooth paste. In order to trace down the offending agent, he not only has a thorough physical and laboratory examination done, but he proceeds with questions as to food in discretion, the use of drugs (including laxatives, headache remedies, and sedatives) and the application of hair restorers, dyes, scalp and dandruff remedies, eyebrow pencils, shades, eyelash applications, curlers, and even eyedrops, cosmetic or medical. He advises keeping the patient off the "seven C's": cocktails, coffee, condiments, cigarettes, carbohydrates, chocolate, and cosmetics.

Ralph W. Danielson.

Fleischanderl, Arthur. **Impregnation of the cornea with mercury.** Klin. M. f. Augenh., 1940, v. 104, April, p. 423.

Mercury to which 5 percent of sulphuric acid had been added entered the right eye of a man of 41 years. The cornea showed a large number of silvery globules which had penetrated the epithelium and were arrested at Bowman's membrane causing small opaque discs. By introduction of boric-acid salve the particles of mercury were removed; the cornea was clear on the second day with restoration of normal vision. C. Zimmermann.

Gorovaja, X. G. **Ocular traumatism with an indelible pencil.** Viestnik Opht., 1939, v. 15, pt. 6, p. 85.

Four cases are reported. These are serious injuries, and the outcome depends on the chemical composition of the pencil and the promptness of medical attention. Ray K. Daily.

Hartmann, Karl. **Artificial injury of the eye by the hairs of burs (lappa vulgaris).** Klin. M. f. Augenh., 1940, v. 104, April, p. 442.

Hartmann describes a severe self-inflicted injury of both eyes with the hairs of burs (lappa vulgaris) in an imbecile girl of 16 years. The tarsal conjunctiva was covered by a pseudomembrane, with velvety swelling and papillary excrescences. The spines of the burs had bored deeply into the conjunctiva and had caused abscesses. The corneae showed large defects, infiltrations, and small round erosions with vesicles. After the hairs were extracted, and the papillary excrescences incised and curetted, the affection healed leaving slight corneal scars.
C. Zimmermann.

Love, J. M. **A practical method of localizing a foreign body in the eye when a Sweet localizer is not available.** Military Surgeon, 1940, v. 86, March, p. 281.

A pair of ordinary metal spectacles with rims is modified by soldering fine wire in the vertical and horizontal diameters of the rims and by attaching a small leaden rider to the temple. The frame is placed on the patient and the leaden rider adjusted 10 mm. from the anterior surface of the cornea. Two flat plates are taken, one anteroposteriorly and the other laterally with a fine focus tube at a distance of 30 inches. From these plates the position of the foreign body can be calculated in relation to the frames. Two successful applications are described. John C. Long.

Maisel, S. A. **A metallic fragment in the anterior chamber.** Viestnik Opht., 1939, v. 15, pt. 5, p. 86.

A woman 36 years old had a piece of metal on the iris of the right eye for 11 years without functional or inflammatory disturbances. Ray K. Daily.

Meyendorf, N. **Traumatic blepharospasm.** Klin. M. f. Augenh., 1940, v. 104, April, p. 412.

The condition, which was attributed to traumatic hysteria, developed in a woman of fifty years after the patient had been pushed over by a bicyclist.
C. Zimmermann.

Öylü, Lutfi. **Allergy.** Türk Oft. Gazetesi, 1938, v. 2, pt. 10, p. 495. (French abstract: 1938, v. 2, pt. 11, p. 586.)

The author reports two cases of allergic conjunctivitis following prolonged use of zinc-sulphate collyrium.
George H. Stine.

Powell, L. S., Hyde, M. E., and Russell, J. **Observations on the eyes**

during metrazol treatment. Jour. Kansas Med. Soc., 1940, v. 41, March, p. 97.

The authors add subconjunctival hemorrhages and nystagmus to their earlier report. Theodore M. Shapira.

Puglisi-Durante, Giovanni. **Transitory myopia from arsenobenzol.** Boll. d'Ocul., 1939, v. 18, Aug., pp. 641-645.

A 40-year-old luetic patient, under treatment with an arsenobenzol preparation, became suddenly myopic, with vision of 1/10 in each eye. His vision was normal with correcting lenses of −3.50 sph. in the right eye and −2.50 sph. in the left eye. The myopia disappeared when the drug was discontinued. (Bibliography.)

M. Lombardo.

Rönne, Henning. **Marking of the eyeball for localization of foreign bodies.** Ophthalmologica, 1940, v. 99, Feb., p. 1.

In order to obtain a known point of reference on the eyeball in a roentgenogram, the author places a very thin silver flake on the upper limbus. It stays in place despite movements of the eyeball. To mark a point on the lower limbus, he melts the end of a very thin wire (such as used in a hypodermic needle) to form a tiny sphere. The wire is inserted through a small hole in the conjunctiva, placed so that the bulbous end will lie on the limbus. F. Herbert Haessler.

Shimkin, N. I. **Ophthalmic injuries in war.** Brit. Jour. Ophth., 1940, v. 24, June, pp. 265-286.

Observations on 238 cases of eye injury cared for at the chief casualty clearing station and 593 cases in base hospitals, during the World War. The difficulties in diagnosis, treatment, and prognosis are reviewed. Among 100 cases, 50 enucleations were necessary, 77 percent losing the sight in one eye and 11.8 in both eyes. Only one case of sympathetic ophthalmia was noted.

The present war threatens to cause a greater number of blind than the previous one because of the "open" methods of warfare. (Figures, bibliography.) D. F. Harbridge.

Skydsgaard, Henning. **Cataract following electric shock.** Acta Ophth., 1939, v. 14, pt. 4, p. 460.

Review of the literature and report of a case of electric cataract in a worker who had received a shock from a current at a tension of 6,000 volts. He was burned about the hands and face, and the cataract developed one year later. The opacity was localized in the anterior capsule and in the subcapsular parts of the lens, with the nucleus and cortex remaining clear.

Ray K. Daily.

Zorab, E. C., and Burns, W. L. **A case of luxatio bulbi.** Brit. Jour. Ophth., 1940, v. 24, June, pp. 286-288.

A fireman aged 29 years injured his eye by falling in the dark and striking his face on what he thought to be a biscuit tin. The eye was dislocated anteriorly, with the lids, in marked spasm, almost closed behind the eye. The eyeball was replaced after facial-nerve blocking with novocaine. The patient left the hospital in 19 days with a clear cornea, full movements, and 6/5 vision with correction in each eye. The comparative lack of pain throughout and the absence of signs in the fundus are noted. The inflammation of Tenon's capsule responded to irrigation, metaphen drops, and short-wave diathermy. (Bibliography.)

D. F. Harbridge.

17
SYSTEMIC DISEASES AND PARASITES

Bégué, H., Brissot, M., and Maillefer, J. **Eye trouble in the "syndrome of Little" (spastic cerebral diplegia).** Bull. Soc. d'Opht. de Paris, 1938, Dec., p. 602.

This report is based upon a study of 24 children chosen at random from an institution for abnormal children, said to be a "veritable nursery" of Little's disease. Of the 27 children 37 percent were found to have normal eyes, 37 percent had strabismus, 26.5 percent nystagmus, 22 percent pale discs, 18 percent myopia, and 7.4 percent optic atrophy. Fournier considered hereditary syphilis as the principal factor of "Little's disease," but as a result of their clinical and pathogenic researches the authors conclude that syphilis plays a minor etiologic role. The preponderant causes are difficult labor, tuberculosis, alcoholic or epileptic heredity, consanguinity of parents, and finally the aftereffects of diseases of infancy. (13 references.)

Jerome B. Thomas.

Hagedoorn, A. **Amaurotic idiocy and related condition.** Amer. Jour. Ophth., 1940, v. 23, July, pp. 735-759.

Hallerman, W. **Relapses of ocular tuberculosis.** Klin. M. f. Augenh., 1940, v. 104, April, p. 387.

Out of the numerous exogenous and endogenous causes which render the course of tuberculosis so changeable, atmospheric influences certainly have an essential importance. Only systematic observations for years may make these connections clear.

C. Zimmermann.

Levin, O. L., and Behrman, H. T. **Treatment of ocular syphilis.** Arch. of Ophth., 1940, v. 23, April, pp. 693-704.

Continuous therapy with bismuth compounds and arsphenamine is still the most valuable method of treatment for ocular syphilis. Iodides should be used in all the various stages and clinical phases of this disease. Herxheimer reactions are usually avoided if two or three preliminary injections of a mercury or bismuth compound are given before the use of arsphenamine. Nerve recurrences usually result from inadequate or short courses of intermittent treatment. The use of mapharsen, silver arsphenamine, sulpharsphenamine, and tryparsamide is discussed. Intraspinal therapy is advocated in resistant cases. Hyperpyrexia may reverse the state of the spinal fluid in 40 percent of cases and arrest the clinical progress in about 15 percent.

J. Hewitt Judd.

Lewis, P. M. **Ocular complications of meningococcic meningitis.** Amer. Jour. Ophth., 1940, v. 23, June, pp. 617-632.

Powell, L. S., Hyde, M. E., and Russell, J. **Observations on the eyes during insulin shock treatment.** Jour. Kansas Med. Soc., 1940, v. 41, Feb., p. 55.

During insulin-shock coma there is an early gradual progressive dilatation of the pupil. The pupillary reaction to light is retained but is accompanied by hippus. There is marked transitory haziness of the vitreous, acceleration of retinal circulation, and moderate increase in intraocular tension. All eye changes subside on administration of sugar solution.

Theodore M. Shapira.

Powell, L. S., and Smith, H. S. **Eye studies following lumbar puncture.** Amer. Jour. Ophth., 1940, v. 23, July, pp. 792-795.

Semadeni, B. **First proof in Switzerland with the slitlamp microscope of numerous microfilaria in both eyes.** Klin. M. f. Augenh., 1940, v. 104, April, p. 417.

A geologist of 36 years who had lived for two years in Africa noticed occasional slight redness of the eye, zoster-like eruptions on the forehead, swelling of the left auricle and nose, and pain in the breast and abdomen with dyspnea and nervous excitement. A diagnosis of hysteria had frequently been made. The slitlamp revealed numerous keratitic foci, mostly under Bowman's membrane, produced by parasites from 0.2 to 0.3 mm. in length. Such foci were also present in the anterior chamber. Excised pieces of skin contained microfilaria which were classed by zoologists as omhocerca volvulus. They are transmitted to the human body by the bite of a fly, simalium damnosum. The prognosis as to preservation of vision is in most cases considered good. The eye must be protected by dark glasses.

C. Zimmermann.

Traquair, H. M. **Manifestations of tuberculosis in ophthalmic practice.** Edinburgh Med. Jour., 1940, v. 47, Jan., p. 57.

This paper written for men who are interested in tuberculosis and who are not ophthalmologists, suggests the fact that tuberculosis affects the eye both by allergy and by actual infection. Among the allergic manifestations listed are scrofulous ophthalmia and scleritis. Among actual infections are listed Mikulicz' disease, uveoparotid tuberculosis, acute miliary tuberculosis, disseminated choroiditis, iridocyclitis, and sclerokeratitis. The author comments upon the well-known fact that a characteristic of all forms of tuberculosis in association with the eye is the absence of gross manifestations of active tuberculous infections, such as pulmonary or joint disease. In cases with indeterminate clinical features diagnosis may be difficult and it may be possible to form only what is known as a "probability diagnosis." In treatment it is essential to remember that the aim is not mere healing of the eye by local measures, but general care of the patient. In some cases, the patient must be treated almost as if he had active pulmonary tuberculosis.

Ralph W. Danielson.

Wegner, W. **Remarks on ocular tuberculosis.** Med. Klinik, 1940, v. 36, Jan. 5, pp. 10-12.

Tuberculosis, says this German author, is the most frequent cause of chronic recurring inflammation of the eye. According to the author individuals with ocular tuberculosis almost invariably show signs of lymphatic diathesis. The internist and especially the pediatrician are familiar with the fact that lymphatic individuals often have severe glandular tuberculosis but very rarely progressive pulmonary tuberculosis.

Ocular tuberculosis, through complicating secondary glaucoma, is one of the most frequent causes of blindness. Atmospheric conditions play as important a role in ocular tuberculosis as in the pulmonary type.

Bertha A. Klien.

Wegner, W. **New aims in the combat against ocular tuberculosis.** Klin. M. f. Augenh., 1940, v. 104, April, p. 395.

Most reports on therapeutic results are too optimistic and misleading, because they consider excessively brief periods. As tuberculosis of the eye is considered to be one of the most frequent causes of blindness we must do

everything to improve the prognosis, and these chronic patients must be cared for during the whole duration of the disease. Wegner discusses these points from his experience with almost 2,000 patients observed for several months. Only treatment of 10, 20, or 30 years can give a real picture of success or failure. Great care of the organ is more important than stimulation, as this leads to reaction of the inflamed tissue and even slight exudation. In the climatic-dietetic cures at high altitudes any specific means may be superfluous and even dangerous. All patients must be examined semi-annually. C. Zimmermann.

Wohl, M. G., and Feldman, J. B. **Vitamin-A deficiency in diseases of the liver: its detection by dark-adaptation method.** Jour. Lab. and Clin. Med., 1940, v. 25, Feb., p. 485. (See Section 10, Retina and vitreous.)

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Ballantyne, A. J. **Problems of vision in aviation.** Glasgow Med. Jour., 1940, v. 133, March, p. 73.

Vision is by far the most important factor contributing to the skill of the pilot. Ocular disturbances resulting from altitude and acceleration are mentioned. Glare may vary visual acuity and accommodation, and may produce defective adaptation and night blindness. Conjunctival irritation and inflammation may occur. Mention is made of a few cases of retinal or cerebral hemorrhages or detachment which were attributed to stunt flying. Failure of oxygen supply at high altitudes is a very serious matter. F. M. Crage.

Blake, E. M. **Santa Lucia, patroness of the eyes.** Arch. of Ophth., 1940, v. 23, March, pp. 526-533.

Many facts which have been historically recorded regarding the life, trial, and death of Santa Lucia are presented, together with the legends which sprang up, apparently several hundred years later. The story of the loss of her eyes has no historical basis.

J. Hewitt Judd.

Callander, L. D. **Miners' nystagmus from the medicolegal aspect.** Trans. Ophth. Soc. United Kingdom, 1939, v. 59, pt. 2, p. 763.

The number of miners with nystagmus applying for compensation invariably increases if employment is bad and wages are low. The author feels that all men over sixty years of age should be taken out of the colliery and put to work on the surface. If an industry incapacitates a man, that industry should rehabilitate him.

Beulah Cushman.

Dimshitz, L. A., Mikaelian, P. X., Barachurkov, P. A., and Barbel, I. E. **Vasili Vasilievich Chirkovski.** Viestnik Opht., 1939, v. 15, pts. 3-4, p. 3.

This eulogy is a tribute to the forty years of Chirkovski's scientific activity. His particular interest is bacteriology of the eye; he became interested in this branch of ophthalmology through his work in the laboratories of Axenfeld and Morax. In spite of the fact that he is an outstanding ophthalmologist, his advance in Czarist Russia was checked by the reactionary minister of education, who twice failed to confirm his appointment to a professorship. After the revolution he advanced rapidly, and at present holds the directorship of ophthalmology in the first Leningrad Medical Institute, where he trained many of the outstanding Russian ophthalmologists. In addition to his scientific interest he has a deep sense of civic responsibility and has rendered

valuable administrative service to the various universities with which he was connected, and to numerous governmental agencies. Ray K. Daily.

Duggan, J. N., and Chitnis, V. K. **The development of ophthalmology in Bombay.** Brit. Jour. Ophth., 1940, v. 24, May, pp. 213-229.

The story of ophthalmology in Bombay is presented from the time when ophthalmology was considered a minor branch of surgery, down to the foundation and continuation of the Sir Cowasji Jehangir Ophthalmic Hospital. It is stated that the hospital has an international reputation, some of the most eminent ophthalmic surgeons from overseas having frequently visited it. The hospital has the best of modern equipment for diagnosis and treatment of eye diseases. The bed capacity is one hundred, with an out-patient department large enough to care for from three to four hundred cases daily. (References.) D. F. Harbridge.

Dvinianinov, V. K. **Trachoma in the Urschum region of the Kirov district.** Viestnik Opht., 1939, v. 15, pt. 6, p. 93.

An analysis of the public-health work relative to trachoma shows that the most effective work was accomplished among patients 8 to 17 years of age, and the least effective among children under seven. The author attributes the good results to the coöperation possible among school children and the poor results to the lack of coöperation in the home. Ray K. Daily.

Esser, A. M. **Diplopia in antiquity.** Klin. M. f. Augenh., 1940, v. 104, April, p. 449.

Quotations from ancient authors, as Plutarch, Ptolemy, Aristotle, Galen, and others. C. Zimmermann.

Gault, A. **Report of a study tour among the ophthalmic centers of central Europe, Rumania, and the north of Italy.** Bull. Soc. d'Opht. de Paris, 1938, Oct., p. 424.

Contents as described by title.

Geilikman, O. B., and Zalutski, L. E. **Gonoblennorrhea in Russian Mongolia.** Viestnik Opht., 1940, v. 16, pt. 1, p. 76.

The habits of the Mongols, characterized by early sexual life, sexual promiscuity, and general and sanitary ignorance, are conducive to the prevalence of venereal disease. The frequency of gonorrhea among the various groups is 9 to 24 percent among men and 13 to 24 percent among women, yet ophthalmoblennorrhea is rare. During four years it constituted only 0.13 percent of the ocular affections, and the course of the disease was relatively mild. The author believes that during a long period of time, the adjustment between the microörganism and the macroörganism led to a loss of microbic virulence. Ray K. Daily.

Halbron, Pierre. **The fiftieth anniversary of the foundation of the Société d'Ophtalmologie de Paris.** Bull. Soc. d'Opht. de Paris, 1938, Nov., p. 494.

The celebration took place in Paris on November 20, 1938, and included a brief history of the Society by Magitot and formal addresses by Kalt, Van Duyse, Amsler, Faber, and Bonnet. The scientific contributions consisted of a paper by Lhermitte on "Anatomopathologic and pathogenic conditions of cerebral softening" and a paper on retinitis by Dubois-Poulsen (see Section 10, p. 962). Jerome B. Thomas.

Hessberg, R. **A useful protection for the blind in traffic.** Ophthalmologica, 1940, v. 99, March, p. 105.

The author stresses the value of the white cane first used by the blind of Paris in 1930. It has an advantage over the international yellow arm band which the deaf are also permitted to use. F. Herbert Haessler.

Hickernell, L. M. **A survey of illumination in selected college buildings.** Sight-Saving Review, 1939, v. 9, Dec., p. 259.

This is a report of the findings and recommendations from a survey regarding illumination of college buildings obtained at Colgate, Cornell, Rochester, and Syracuse. There is much technical information regarding the illumination and arrangement of libraries, dormitories, laboratories, and classrooms. Special thought is directed to the maximum use of daylight with the efficient use of artificial light, having an adequate number of foot-candles but without glare. (35 references.) Ralph W. Danielson.

Holm, Ejler. **Marius Tscherning.** Acta Ophth., 1939, v. 17, pt. 4, p. 359.

Tscherning died on September 1, 1939, at the age of 85 years. A world-renowned ophthalmologist, his chief interest was in physiologic optics, and his most important contribution was the invention of photometric glasses. (Bibliography of his contributions.)
Ray K. Daily.

Jackson, Edward. **Development of modern ophthalmology in one lifetime.** Amer. Jour. Ophth., 1940, v. 23, July, pp. 759-770.

Krimsky, Emanuel. **Orthoptics at the crossroads.** Arch. of Ophth., 1940, v. 23, March, pp. 619-622.

In order to overcome the difficulties of expense and the management of the child, it is suggested that coöperation of the schools be obtained so that a health teacher or a health-education department can assist the ophthalmologist in the management of these cases in the same way as the problems of behavior, deafness, speech difficulties, and cardiac conditions are now being handled. J. Hewitt Judd.

Laborne Tavares, C. **Geographic distribution of trachoma in Minas Gerais.** Segundo Cong. Brasileiro de Ophth. In Arquivos de Clin. Oft. e Oto-Rino-Laring., 1938, v. 5, Sept.-Dec., pp. 310-314.

The author reviews the history of trachoma in the state of Minas Gerais (Brazil), during the past 45 years. Statistics, prophylaxis, and treatment of the cases are reported.
Ramon Castroviejo.

Lambert, R. K. **The spasmogenic tendency and its relation to the eyes.** New York State Jour. of Med., 1940, v. 40, March 1, p. 334.

Lambert calls attention to the fact that a patient should not be studied and treated as an optical or oculomotor mechanism but should be studied as an individual sufferer. Emotion must be studied as well as habits, rest and other factors. Any extensive investigation along psychiatric lines is avoided.
Theodore M. Shapira.

Lancaster, W. B. **The American Board of Ophthalmology.** Amer. Jour. Ophth., 1940, v. 23, June, pp. 651-656.

Lavery, F. S. **Trachoma in Ireland.** Trans. Ophth. Soc. United Kingdom, 1939, v. 59, pt. 2, p. 850.

The figures obtained as a result of the inspection of two blind asylums and

many records of the blind would indicate that trachoma is responsible for 9 percent of the blindness in Ireland. After considerable trial the author concluded that sulphanilamide was useless in the treatment of trachoma.

Beulah Cushman.

Luckiesh, M., and Moss, F. K. **The readability of stencil-duplicated materials.** Sight-Saving Review, 1939, v. 9, Dec., p. 295.

The results of the present investigation indicate that the visibility of the average quality of stencil-duplicated materials in common use is approximately 70 percent of that which may be achieved by the best stencil-duplicating processes. It follows from this fact that the average material is unnecessarily difficult to read and this conclusion is substantiated by the rate of blinking while reading this material. A similar conclusion is also indicated by the criterion of speed of reading. Of the three criteria, that of relative visibility is the only one yielding results which at present may be compared upon a quantitative basis with respect to visual functions and limitations. (8 references.) Ralph W. Danielson.

Pimentel, P. C. **Ocular traumas in compensation cases.** Segundo Cong. Brasileiro de Ophth. In Arquivos de Clin. Oft. e Oto-Rino-Laring., 1938, v. 5, Sept.-Dec., pp. 330-354.

During the years 1935 and 1936 the author studied 2,400 cases of ocular injuries. Cause, profession, statistics, and other topics are discussed. Compensation according to the Brazilian law is reviewed. The author makes suggestions in regard to means of avoiding injuries of this kind and proposes a revision of the existing compensation laws. Ramon Castroviejo.

Samuels, Bernard. **Edward Delafield: a sketch.** Amer. Jour. Ophth., 1940, v. 23, June, pp. 670-678; also Trans. Amer. Ophth. Soc., 1939, v. 37, p. 77.

Somerville-Large, L. B. **Ophthalmia neonatorum in Dublin.** Trans. Ophth. Soc. United Kingdom, 1939, v. 59, pt. 2, p. 855.

Thirty-nine cases of ophthalmia neonatorum in 34,867 births were reported in Dublin for the years 1936 to 1938, and in contrast no cases were reported in 8,136 births at the Rotundo Hospital during the same period. The prophylaxis of the Rotundo Hospital is summarized as: prenatal care to 60 percent of the mothers; instillation of 1-percent silver nitrate as soon after birth as possible, and if the mother has a positive smear another drop after the first bath. The solution is renewed every three weeks. Treatment consists of breast feeding, frequent swabbing instead of irrigation, and the instillation of mercurochrome in oil.

Beulah Cushman.

Van der Hoeve, J. **The use of names in the medical sciences.** Graefe's Arch., 1940, v. 141, pt. 1, pp. 99-105.

The author calls attention to the customary use of men's names to describe symptoms, diseases, syndromes, reactions, and so on. He gives many excellent reasons for using appropriate descriptive names for diseases and symptoms, in place of authors' names. Basedow's disease is associated with Graefe, Stellwag-Dalrymple, and Moebius signs. Some illnesses are called by a series of names, such as Laurence-Moon-Bardet-Biedl disease. Paget's disease may refer to three separate pathologic processes (of the bone,

nipple, or penis). The physicians of different countries may describe a disease by the names of different men, as with Basedow's and Graves's disease.
Charles A. Perera.

Wilson, Arnold. **Eye injuries, workmen's compensation and disability schedules.** Trans. Ophth. Soc. United Kingdom, 1939, v. 59, pt. 2, p. 799.

As a member of parliament the author emphasizes the importance which all members of parliament attach to professional opinion when an organized expression is given. He urges that regard and respect be extended in all deliberations of compensation of eye injuries. The ultimate consequences of the loss of one eye may include reduction of technical capacity for work, disfigurement, danger of sympathetic ophthalmia, the increased danger of losing the other eye, and difficulty in finding work. It makes an important difference whether or not the lost eye is the master eye. Beulah Cushman.

19

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

O'Day, Kevin. **The fundus and fovea centralis of the albatross (Gould's Diomedea cauta cauta).** Brit. Jour. Ophth., 1940, v. 24, May, pp. 201-207.

It is stated that the site of the fovea cannot be definitely determined, although a circular area is seen to the nasal side of the upper part of the base of the pecten. The dimensions of the eye of the albatross are given, the bird itself being the size of a large goose. The shallower fovea of man is compared to that of the albatross. (References, illustrations.) D. F. Harbridge.

Ueberreiter, O. **Comparative ophthalmology.** Schweiz. med. Woch., 1939, v. 69, Dec., p. 1108.

This article, from the surgical and eye clinics of the Veterinary Institute of Vienna, describes the occurrence in animals of various eye conditions and diseases. Theodore M. Shapira.

NEWS ITEMS

Edited by Dr. H. Rommel Hildreth
640 S. Kingshighway, Saint Louis

News items should reach the Editor by the twelfth of the month

Deaths

Dr. Ben Witt Key, New York City, died June 5th, 1940, aged 56 years.

Miscellaneous

The University of Oregon Medical School dedicated its new library and auditorium on June 7, 1940. A large bronze bas-relief of Dr. Weeks in profile, the work of the eminent sculptor, Gabriel Lavare, was presented by the many friends of Dr. Weeks. Beneath it is the following inscription: JOHN E. WEEKS, M.D., Sc.D., LL.D., WHOSE GENEROUS DONATION MADE POSSIBLE THIS BUILDING. PIONEER IN RESEARCH, RESTORER OF SIGHT, TEACHER OF TEACHERS, "LABOR OMNIA VINCIT."

Sun glasses should be worn only when you are in the bright sun and should not be used for night driving, says Dr. Arno E. Town of New York City in the current issue of The Sight-Saving Review, quarterly journal of the National Society for the Prevention of Blindness. Dr. Town is a member of the society's medical committee.

"In a survey which I have made of a representative group of ophthalmologists throughout the country," says Dr. Town, "the results show unanimous agreement that sun glasses should be worn only in the bright sun. Fifty percent are of the opinion that they may be harmful if used otherwise. Furthermore, all the eye physicians agree that only ground and polished glasses should be worn."

The Treacher Collins Prize Essay. Under this title, the Council of the Ophthalmological Society of the United Kingdom has instituted a prize of 100 pounds, awarded triennially, for the best essay submitted upon a subject selected by the Council. The prize shall be open to qualified medical practitioners of any nationality. The essay shall be written in the English language. The subject for the second award of the prize is "Allergic affections of the eye and its adnexa." The closing date for sending in essays for the second award is December 31, 1941. Essays should be submitted to the Honorary Secretary, Ophthalmological Society of the United Kingdom, 5 Racquet Court, Fleet Street, E.C. 4, from whom also any further particulars can be obtained. No name should be on any essay, but a distinguishing pseudonym or quotation, which should also be upon a sealed envelope containing the candidate's name and address. This envelope should accompany the essay.

Medicine will contribute to the growing cooperation of the Americas when the first Pan-American Congress of Ophthalmology, bringing together a large group of eye specialists of the Western Hemisphere, meets in Cleveland, Ohio, October 11th and 12th.

The American Academy of Ophthalmology and Otolaryngology, a society of more than 2,500 specialists of the United States, undertook sponsorship of the Pan-American Congress as a means of promoting greater solidarity and wider acquaintance among medical men of the Americas. The need of such a gathering was emphasized by the postponement of the International Congress of Ophthalmology, which was to have met in Vienna in 1941, made necessary by the European conflict.

The first event of the congress will be a joint banquet with the Academy Wednesday evening, October 9th, at which Dr. Frank Brawley, Chicago, president of the Academy, will preside. Thursday afternoon, October 10th, the official delegates appointed by the various governments will meet with representatives of ophthalmologic societies to draw up a constitution and make plans for future meetings.

Official recognition of the congress will be extended by the city of Cleveland at a reception Friday evening, October 11th.

The scientific program will occupy two days, Friday and Saturday, October 11th and 12th. Papers will be divided equally between speakers from the Latin-American countries and those from the United States. Papers in Spanish or Portuguese will be discussed by English-speaking physicians and those presented in English will be discussed by Latin-American speakers. Slides showing a résumé of each paper are to be shown on a screen in the two languages other than the one being spoken.

Among those from South American countries who will appear on the program will be:

Dr. Pereira Gomes, chief of an eye clinic at the General Hospital, São Paulo, Brazil.

Dr. Cesario de Andrade, professor of ophthalmology, Faculdade de Medicina, Cirurgia y Pharmacia, Bahia, Brazil.

Dr. A. Vasquez Barriere, professor of ophthalmology, University of Montevideo Faculty of Medicine, Montevideo, Uruguay.

Dr. Carlos Charlin, professor of ophthalmology, University of Santiago, Chile.

Dr. Santiago Barrenechea, assistant professor of ophthalmology, University of Santiago, Chile.

In addition, there will be Dr. Arturo Quevedo, Guatemala City; Tomas R. Yanes, Havana, Cuba, editor of the Revista Cubana de Oto-Neuro-Oftalmiatria; Rafael Silva, Mexico City, for many years secretary of the Sociedad Mexicana de Oftalmologia y Otorinologia; Manuel U. Troncoso, formerly of Mexico and now of New York; and Manuel Marquez y Rodriguez, formerly a prominent ophthalmologist and teacher in Madrid, now living in Mexico City.

Among those who will discuss papers presented in English will be: Drs. Horacio Ferrer, Havana; Mendonca de Barros and Feliciano Penido Burnier, São Paulo; Heitor Marback, Bahia; and Dr. Aniceto Solares, La Paz, Bolivia.

English-speaking physicians who will present papers will include:

Dr. William L. Benedict, Mayo Clinic, Rochester, Minnesota.

Dr. Derrick T. Vail, professor of ophthalmology, University of Cincinnati, Cincinnati, Ohio.

Dr. S. Hanford McKee, professor of ophthalmology, McGill University Faculty of Medicine, Montreal, Canada.

Dr. John O. McReynolds, Dallas, Texas.

Dr. Samuel Rodman Irvine, Los Angeles, California.

Dr. Alan Woods, acting professor of ophthalmology, Johns Hopkins University of Medicine, Baltimore.

Dr. Sanford Gifford, professor of ophthalmology, Northwestern University Medical School, Chicago.

Dr. Arthur J. Bedell, Albany, New York.

The committee of the American Academy of Ophthalmology and Otolaryngology which is arranging the Pan-American Congress is made up of Drs. Harry S. Gradle, Chicago; Conrad Berens, New York; and Moacyr E. Alvaro, São Paulo, Brazil.

Societies

The sixth annual meeting of the Mississippi Valley Medical Society will be held at Rock Island, Illinois, September 25th to 27th.

Personals

Dr. James M. Shields announces the association of Dr. Thomas M. Van Bergen with him in the practice of ophthalmology at 264 Metropolitan Building, Denver.